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Phytotelmata and Malaria Prevalence in Selected Rural Communities of Emuoha Local Government Area, Rivers State, Nigeria

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Abstract

The study investigated the possible influences of phytotelmata on the prevalence of malaria in selected rural communities in Emuoha Local Government Area of Rivers State, Nigeria during the rainy season (**June - November**) of 2019. Existing malaria data sheet from Model Primary Health Centre Ndele, Rumuji and Ibaa (**MPHC-N, MPHC-R and MPHC-I**) were utilized. *Ex-post factor* design was employed and was aimed at collecting data and analyzing some variables retrospectively without manipulating any of the variables. Wide variation in prevalence of malaria among age groups were observed in **GPA** 5.56006-10.7727 (81.6670 ± 1.01379), **GPB** 4.2886-7.3781 (5.8333 ± 0.60093), **GPC** 2.5367-6.4633 (4.500 ± 0.76376), **GPD** 7.0258-10.6409 (8.8333 ± 0.70317), **GPE** 5.0258-8.6409 (6.8333 ± 0.70317), **GPF** 3.3996-7.9397 (5.6667 ± 0.85192), **GPG** 5.6219-8.7114 (7.1667 ± 0.60093), **GPH** 3.5667-7.4633 (5.5000 ± 0.76396) and **GPI** 6.6814-13.3186 (10.0000 ± 1.29099), respectively. **GPA (0-5yrs)** with minimum value of 7.500 was recorded in Rumuji (**MPHC-R**) while its maximum value of 9.333 was recorded in Ibaa (**MPHC-I**). **GPB (6-11yrs)** minimum value of 5.333 was recorded in recorded in Ndele (**MPHC-N**) while its maximum value of 8.000 was recorded in Ibaa. The least prevalence rate of 6.333 in the month of **August** was recorded in **MPHC-N** while its maximum value of 8.4444 was recorded in **MPHC-I**. There was significant spatial heterogeneity in mean variance of the malaria prevalence in GPC at $P < 0.05$ with **GPA, GPB, GPD, GPE, GPF, GPH and GPI** showing spatial homogeneity at $P < 0.05$, respectively. Findings indicate that the slight increase of the prevalence of malaria during the month of **August** may have occurred due to the unregulated phytotelmata plants planted proximally at neighborhood, which has the capacity of impounding water that probably serve as repository for mosquito breeding. Thus, phytotelmata (plantain, banana, pineapples, cocoa yam etc.) should always be planted far off from living premises in a bid to control and prevent high rate of malaria prevalence in the selected communities among other recommendations.

Keywords: phytotelma, mosquitoes, prevalence, malaria, ecosystem

1.0 INTRODUCTION

Phytotelmas are plants that has the capacity to retain water. It is a small water field capacity in terrestrial plant (Frank & Lounibos, 1983). According to Derraik (2005), the word is coined by Vargas in 1928 to describe bodies of water impounded by plants. The rate of water accumulation in the plant (*phytotelmas*) differs significantly from species to species. For example, not all bromeliads (a sub-group of phytotelmas) has the same rate and capacity to impound water bodies (Petrie, 2019). The water retention capability of phytotelma is in some specific sections of the plant which include the tree-hole, leaf axils, flowers modified leaves fallen vegetation parts, fallen fruits husks and stem

rots (Greeney, 2001). The water retention time-lag in these phytotelmas is unique and thus, become more significant in public and environmental health. This is evident as some arthropods (e.g., mosquitoes) are quite adapted to breeding in such environment. Part of Mosquitoes (*Anopheles*) life cycle is hydro depended mostly their egg, larvae, pupa, and the early stage of the imago. Studies have shown that some female species of mosquitoes can lay eggs between 100-300 eggs at one time, and these eggs can hatch within 48 hours (grow into the larvae stage). This define their multiple presence when such enhancing environment is optimal. There are about 3000 species of mosquitoes in the world, and out of these numbers, at 176 of the number could be found in the United States. However, the most common and dangerous of these species include the *Culex*, *Anopheles*, and the *Aedes* genera, respectively, according to the American Mosquito Control Association (AMCA). For example, the female anopheles' mosquitoes are carriers of a disease-causing organism call plasmodium (P), which include several types such as *P ovale*, *P falciparum*, *P vivax* and *P malariae*.

However, in Public and Environmental Health Law, phytotelma is simply seen as water-bearing plants. According to the Public Health Law Cap 106 of Rivers State as amended in 1999, water-bearing plants includes: banana plantation (*Musa acuminata* or *Musa balbisiana*), plantain plantation (*Musa paradisiaca* or *Musa sapientum*) both are herbaceous perennial belonging to the family Musaceae., cocoa-yam plantation (*Colocasia esculenta* and commonly called *elephant ear*), pineapple plantation (*Ananas comosus*) and pawpaw plants (*Carica papaya*). The economic and nutritional values of these fruits are quite enormous but no doubt their water impounding capacity serve as habitation for mosquitoes. More so, these plants are often planted within and around living premises by mostly subsistence and agrarian farmer inadvertently, hence, its implication as a repository in the growth, development and spread of mosquitoes and malaria, concurrently.

The Study area is characterized with intense farming. Cassava, maize, yam, banana, plantains, pineapple, cocoa-yam etc. are often planted. However, plantain, coca-yam, pineapple, banana was observed to be the most common plantations. Nearly every child has his/her own plantain plantation. The Older once have more of the water bearing plants e.g., plantain suckers up to 70 or more than the much younger once. This is because while in their secondary days they had little, and thus increases while working. It becomes more increased when they retire to become full flesh farmers. It is rear to see a household without having these crops in a large quantity. However, the worry in most recent time is the planting of these crops proximally to living premises since their water retention capacity is high and therefore serves as reservoir for the infestation of mosquitoes-the agent that causes malaria.

Several other diseases are associated with mosquito's (e.g., malaria, yellow fever, etc.). Malaria is caused by the female anopheles' mosquitoes and it is a major killer disease, second to diarrhea and third to respiratory disease (e.g., pneumonia, tuberculosis, influenza, whooping cough) (Achal, 2008). There are about 3,500 species of mosquitoes which is modest for a family of insects, but their impact on human health and welfare is catastrophic (Jefferies, 2016). The female anopheles' mosquitoes (FAM) carry the parasites (*plasmodium*) that causes up to 500 million cases of malaria a year, while the Asian Tiger mosquitoes (ATM), *Aedes albopictus* spread dengue fever and Chikungunya virus.

Malaria is one of the most severe global public health problems, mostly in Africa, and Nigeria has the greatest malaria cases (WHO, 2014). There are about 212 million of malaria cases and an estimated 429,000 malaria deaths. However, Nigeria suffers the world's greatest malaria burden, with approximately 51 million cases and 207, 000 deaths annually, as 97% of the population is at risk of infection (WHO, 2014). This define the need to undertake this study despite other variable factors commonly known to have being contributing to the breeding of mosquitoes which explicitly causes malaria. The purpose of this study, however, is to find out the extends to which the prevalence of malaria is related to phytotelmas

2.0 HABITAT AND MOSQUITOES DEVELOPMENT

Mosquitoes (anopheles) breed in the tree-holes, leaf axils, flowers modified leaves, fallen vegetable parts, fallen fruits husks and stem rots (Greeney, 2001; Kitching, 2000). They also breed in water filled hollows and bamboo internodes, petals etc. The developmental stages of mosquitoes have four (4) stages vis-à-vis: egg, larvae, pupa, and the imago (adult) stage. Each of these stages is unique in nature (i.e., it can easily be distinguished by its physical appearances). Whereas other species of mosquitoes (culex and *Culiseta*) lay eggs in rafts; anopheles, *Ochlerotatus*, and *Aedes*, including some other genera, do not make egg rafts, but lay their eggs singly on the water surface, soil flooded with water or water containing receptacles. The eggs hatch into the larvae stage within 24-48 hours as others may withstand chilled winters before hatching. Thus, water becomes an essential part of their habitat. As soon as the eggs are hatched, the larvae stage begins. The larvae are attached to the water surface; and with the aid of the siphon acting as snorkel (breathing apparatus), growth becomes faster. Larvae may grow up to 5mm in length. They become wriggler or wigglers and can swim dipper in the water bodies, feed (i.e., on microorganisms and organic matter), and become extended to form a new exoskeleton. This stage entails skin segmentations stage which are called instars. The larval stage has four instars, and the length of the larval stage ranges from 4 to 14 days. The range is a function of species, water temperature, and food availability. During the skin segmentation stage (fourth molt), the larva metamorphosed into the pupal stage, becomes physically active (i.e., rolling and tumbling activities to escape into deeper waters). In the pupal stage, no feeding occurs but breeding is inevitable. The larvae are sensitive to light, shadow. and other disturbances. The pupal stage lasts from 0.5 to 4 days, after which the pupa's skin splits along the back permitting the afresh formed adult to sluggishly emerge and relax on the surface of the water.

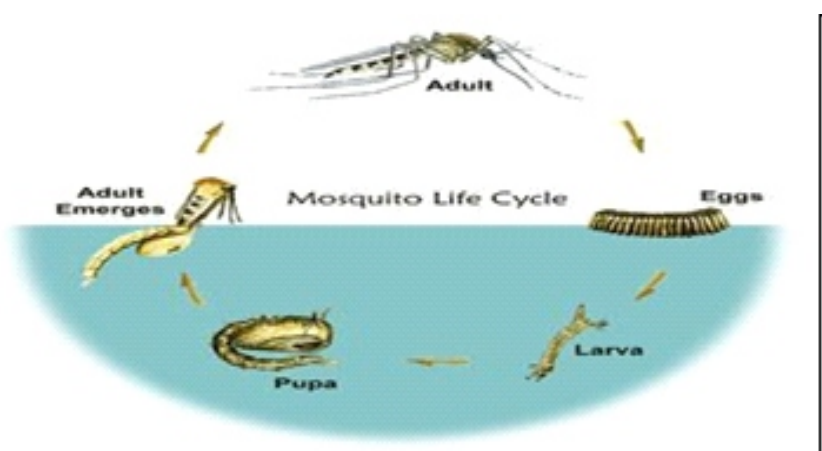


Fig. 1. The developmental stage of Female Anopheles mosquito

The newly appeared adult, relaxes on the surface of the water, and stayed for a very short period for the body to get dry and harden. Within this period, however, the wings will spread out properly, all getting set to fly as an adult mosquito.

3.0 METHODOLOGY

The *Ex-post factor* design was employed in this study, as it aimed at collecting data and analysing some variables retrospectively without manipulating any of the variables. More, relevant literatures on phytotelmas as a function of increased mosquito population growth were cited. Similarly, documents were obtained from Model Primary Healthcare Centres of Ndele, Rumuji and Ibaa,

respectfully. These data expressed age bracket between 0 - 41 years and above, with monthly malaria outcomes from the month of June-November 2019. Furthermore, Data obtained via this medium were organized using SPSS version 17 and Descriptive Statistics with single factor analysis of variance (ANOVA), Correlation, Mean and Standard Error (SE), Variation and Spatial variation.

4.0 RESULT

4.1. Variation in Prevalence among Age Groups

There were wide variations in prevalence of malaria among age groups between health centres (Table 4.1). GPA, GPB and GPC varied from 5.5606-10.7727 (81.6670±1.01379), 4.2886-7.3781(3.0895±0.60096) and 2.5367-6.4633 (3.9266±0.76376), respectively. GPD, GPE and GPF varied from 7.0258-10.6407 (8.8333±0.70317), 5.0258-8.6409 (6.8333±0.70317) and 3.3996-7.9337 (5.667±4.5341), respectively. Also, GPG, GPH and GPI varied from 5.6219-8.7114 (7.1167±0.60093), 3.5367-7.4633 (5.500±0.76376) and 6.6814-13.3186 (10.0000±1.29099), correspondingly (Table 4.1). Furthermore, at **MPHC-N**, the variation in levels of June, July and August were (Range=3.8120), (Range=4.7393) and (Range=3.8433) while September, October and November were (Range=3.0208), (Range=2.8875) and (Range=3.8004), respectively (Table 4.4). Also, at **MPHC-R**, the variation in levels of June, July and August were (Range=3.6054), (Range=3.3309) and (Range=5.4738) while September, October and November were (2.9194), (Range=3-7657) and (Range=5.3255), correspondingly (Table 4.4). Finally, at **MPHC-I**, June, July and August had variations in levels (Range=3.9942), (Range=3.7482) and (Range=5.1052) while September, October and November had (Range=3.1797), (Range=5.0988) and (Range=4.2797), one-to-one (Table 4.4).

Table 4.1 Descriptive Statistics showing Differences in Prevalence among Age Groups

Age GROUP	MINIMUM	MAXIMUM	MEAN	RANGE	SE
GPA	5.5606	10.7727	81.6670	5.2121	1.01379
GPB	4.2886	7.3781	5.8333	3.0895	0.60093
GPC	2.5367	6.4633	4.5000	3.9266	0.76376
GPD	7.0258	10.6409	8.8333	3.6151	0.70317
GPE	5.0258	8.6409	6.8333	3.6151	0.70317
GPF	3.3996	7.9337	5.6667	4.5341	0.85192
GPG	5.6219	8.7114	7.1667	3.0895	0.60093
GPH	3.5567	7.4633	5.5000	3.9266	0.76376
GPI	6.6814	13.3186	10.0000	6.6372	1.29099

**GPA=Group A (0 -5yrs), GPB=Group B(6-10yrs), GPC=Group C(11-15yrs),
GPD=Group D(16-20yrs), GPE=Group E(21-25yrs), GPF=Group F(26-30yrs)
GPG=Group H(36-40yrs), GPI=Group I(41 and above), SE=Standard error of mean.**

4.2 Spatial Variation in Prevalence between Health Centres

The prevalence of malaria between age groups and the different health centres showed variation. In GPA (0-5yrs), the minimum value of 7.500 was recorded in Rumuji (MPHC-R) while the maximum value of 9.333 was recorded in Ibaa (MPHC-I). Also, in GPB (6-10yrs), the minimum value of 5.833 was recorded in Ndele (MPHC-N) while the maximum value of 8.000 was recorded in Ibaa (Table 4.2; Fig. 1). GPC (11-15yrs), the minimum value of 4.500 was recorded in MPHC-N while the maximum value of 10.667 was recorded in MPHC-I. More so in GPD (16-20yrs), the minimum value of 7.167 was recorded in MPHC-I whereas its maximum value of 10.8333 was recorded in MPHC-R. GPE (21-25yrs) had minimum value of 6.000 in MPHC-I while its maximum value of 8.667 was recorded in MPHC-I. Furthermore, in GPF (26-30yrs), the minimum value of 5.667 was recorded in MPHC-N while its maximum was 6.667 of recorded in MPHC-N and MPHC-I, respectively. In GPG (31-35yrs), the minimum value of 7.167 was recorded in MPHC-N while the maximum value of 8.33 was recorded in MPHC-I. Also, in GPH (36-40yrs), the minimum value of 5.500 was recorded in MPHC-N as its maximum value of 9.333 was recorded in MPHC-I. Finally, in GPI (41yrs and above), minimum value of 10.000 was recorded in MPHC-N while its maximum value of 11.500 was recorded in MPHC-I (Fig. 1; Table 4.2). However, the least rate of prevalence (6.333) in the month of June was recorded in MPCH-N while the highest rate of prevalence (8.000) was recorded in MPHC-I. Also, in the month of July, the least rate of prevalence (7.566) was recorded in MPHC-N while the highest rate of prevalence (10.222) was recorded in MPHC-I. In August, September, October and November, the least rate of prevalence (6.333, 5.889, 6.444 and 7.889) were all recorded in MPHC-N while their highest rate of prevalence (8.444, 8.889, 9.667 and 8.333) were recorded in MPHC-I, MPHC-R, MPHC-I, MPHC-R and MPHC-I, respectively (Table 4.3; Fig. 2). The test homogeneity in mean variance of the Age Group parameters across health centres using the single factor analysis of variance (ANOVA) revealed that at $P < 0.05$, the Age parameter in GPC differ significantly while in GPA, GPB, GPD, GPE, GPF, GPG, GPH and GPI it does not (Table 4.5).

4.3 Mean Separation of the Age Groups

A post-hoc mean separation with Duncan Multiple Range Test revealed that the observed difference in GPA (0-5yrs), GPB (6-10yrs), GPF (26-30yrs), GPG (31-35yrs) and GPI (40 and above) were found MPHC-N while GPC (11-15yrs), GPD (16-20yrs), GPE (21-25yrs) and GPH (31-35yrs) was between MPHC-N and MPHC-R, respectively (Table 4.6).

Table 4.2 Age Group and Prevalence across Health Centers

MPHC	0-5yrs	6-10yrs	11-15yrs	16-20yrs	21-25yrs	26-30yrs	31-35yrs	36-40yrs	41+ yrs
N	8.167	5.833	4.500	8.833	6.833	5.667	7.167	5.500	10.000
R	7.500	7.500	6.333	10.833	6.000	6.667	8.33	8.500	10.500
I	9.833	8.000	10.667	7.167	8.667	6.667	8.800	9.333	11.500

MPHCN=Model Primary Health Centre, N=Ndele, R=Rumuiji, I=Ibaa, 41+= 41yrs and above.

Table 4.3 Prevalence between Health Centres and Months

MPHC	June	July	August	September	October	November
N	7.556	7.556	6.333	5.889	6.444	7.889
R	6.333	8.778	8.111	8.889	7.667	8.333
I	8.000	10.222	8.444	8.556	9.667	8.333

MPHCN=Model Primary Health Centre, N=Ndele, R=Rumuiji, I=Ibaa.

Table 4.4 Descriptive Statistics showing Prevalence among Health Centers

Health Center	Months	Minimum	Maximum	Range	Mean	SE
MPHC-N	1	5.4819	9.6292	3.8120	7.556	0.89925
	2	4.8897	10.2214	4.7395	7.556	1.15604
	3	4.4117	8.2550	3.8433	6.3333	0.83333
	4	4.3785	7.3993	3.0208	5.8889	0.65499
	5	5.0007	7.8882	2.8875	6.4444	0.62608
	6	5.9887	9.7891	3.8004	7.8889	0.82402
MPHC-R	1	4.5306	8.1360	3.6054	6.3333	0.78174
	2	7.1123	10.4432	3.3309	8.7776	0.72222
	3	5.2752	10.9470	5.4738	8.1111	1.22977
	4	7.4282	10.3496	2.9194	8.8889	0.63343
	5	5.7838	9.5495	3.7657	7.6667	0.81650
	6	5.6706	10.9961	5.3255	8.3333	1.15470
MPHC-I	1	6.0029	9.9971	3.9942	8.0000	0.86603
	2	8.3481	12.0963	3.7482	10.2222	0.81271
	3	5.8918	10.9970	5.1052	8.4444	1.10694
	4	6.9657	10.1454	3.1797	8.5556	0.68943
	5	7.1173	12.2167	5.0988	9.6667	1.10554
	6	6.1935	12.4732	4.2797	8.3333	0.92796

MPHCN=Model Primary Health Centre, N=Ndele, R=Rumuiji, I=Ibaa; 1-6=June, July, August, September, and October, respectively.

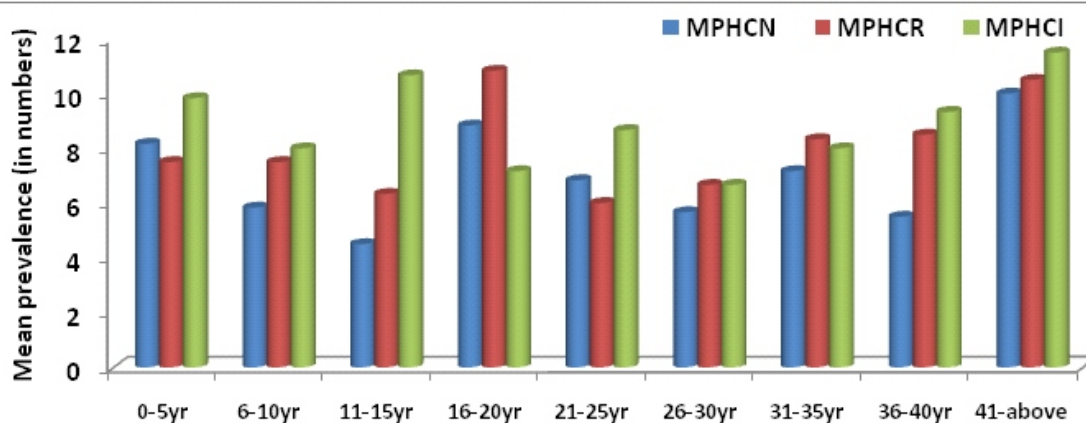


Fig. 2. Prevalence of malaria among age groups in three health centres in Rivers State Age groups

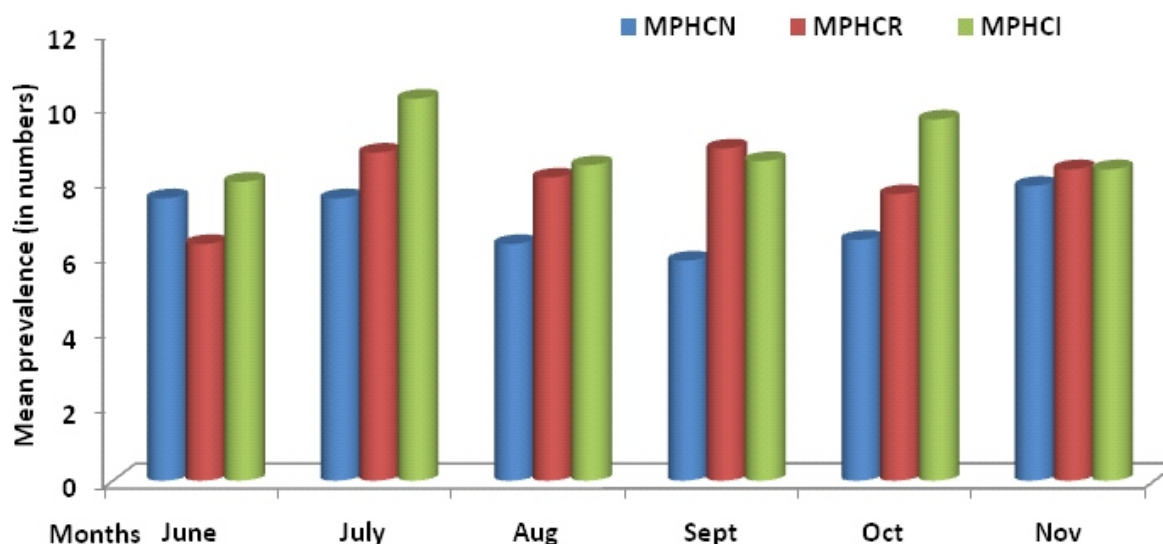


Fig. 3. Prevalence of malaria in three health centres in Rivers State between June and November 2019

Table 4. 5 Analysis of variance (ANOVA)

Source Variation	Sum of Squares	df	Mean Square	F	Sig.
GP_A					
Between Groups	17.333	2	8.667	1.491	.257
Within Groups	87.167	15	5.811	R5555	6666
Total	104.500	17			
GP_B					
Between Groups	15.444	2	7.722	2.132	.153
Within Groups	54.333	15	3.622		
Total	69.778	17			
GP_C					
Between Groups	120.333	2	60.167	12.862	.001
Within Groups	70.167	15	4.678		
Total	190.500	17			
GP_D					
Between Groups	40.444	2	20.222	3.279	.066
Within Groups	92.500	15	6.167		
Total	132.944	17			
GP_E					
Between Groups	22.333	2	11.167	2.880	.087
Within Groups	58.167	15	3.878		
Total	80.500	17			
GP_F					
Between Groups	4.000	2	2.000	.319	.732
Within Groups	94.000	15	6.267		
Total	98.000	17			
GP_G					
Between Groups	4.333	2	2.167	.648	.537
Within Groups	50.167	15	3.344		
Total	54.500	17			
GP_H					
Between Groups	48.778	2	24.389	3.257	.067
Within Groups	112.333	15	7.489		
Total	161.111	17			
GP_I					
Between Groups	7.000	2	3.500	.449	.647
Within Groups	117.000	15	7.800		
Total	124.000	17			

Parameter	MPHC-N	MPHC-R	MPHC-I
GPA	8.6667a	7.5000a	9.8333a
GPB	5.8333a	7.5000a	8.0000a
GPC	4.5000a	6.3333a	10.6667a
GPD	8.3333a, 8.8333b	10.8333a	7.1667a
GPE	6.8333a, 6.8333b	6.6667a	8.6667b
GPF	5.6667a	6.6667a	6.6667a
GPG	7.1667a	8.3333a	8.0000a
GPH	5.5000a	8.5000a, 8.5000b	9.3333b
GPI	10.0000a	10.5000a	11.5000a

GPA=0 -5yrs, GPB=6 -10yrs, GPC=11 -15yrs, GPD=16 -20yrs, GPE=21 -25yrs, GPF=26 -30yrs, GPG=31 -35yrs, GPH=36 -40yrs, GPI=40⁺, MPHC -N=Primary Healthcare Centre Ndele, MPHC -R=Primary Healthcare Centre Rumuiji and MPHC -I=Primary Healthcare Centre Ibaa.

5.1 DISCUSSION

The mean prevalence value recorded in this study was high and comparable to that obtained by Onyiri (2015) and Oluwaseun et al., 2020 in Nigeria. However, values were lower than those recorded by Sabina (2017) in the Northern part of Nigeria but higher than those recorded by Mudhune, Okiro, Noor et al., 2011 in Nairobi, Kenya. The statistical differences in the mean prevalence among age group shows that GPA (0-5yrs) has the highest mean value as opposed to GPC (11-15yrs) which has the lowest mean value. These differences possibly occur due to climatic conditions (monthly weather variations). For example, precipitation is high in the month of June, July, September, October, and November except the month of August due to the “August Break”, yearly. Precipitation increases water impounding capacity of phytotelmas, which in this respect, serve as a repository for mosquito breeding. This corroborates with the views of Greeney (2011) and Chinago (2020). Thus, the current study reveals further that the most prevalence age groups, or bracket include GPA (0-5yrs), GPB (6-10yrs), GPD (16-20yrs), GPE (21-25yrs), GPF (26-30yrs), GPG (31-35yrs), GPH (36-40yrs) and GPI (41+) while GPC (11-15yrs) is least prevalence.

The recorded high prevalence in this study across age groups was found in **MPHC-I** as compared to MPHC-R and MPHC-N, respectively. While the least prevalence across age group was recorded in **MPHC-N**. The high prevalence could be due to poor environmental sanitation practices super imposed by the incessant communal crises experienced during the study period in addition to the proximal plantation of water impounding plants (plantains, cocoyam, banana etc.) within the living premises at **Ibaa**, since much of the people (farmers) no longer carry out farming activities off their residence due to theft, rape, kidnappings, cult activities among others. More so, the least prevalence across age group was recorded in **Ndele**, and this could be as a result of slight improvement on environmental sanitation practices of the citizen fascinated by the relative peace during the study period, the use of insecticidal treated nets (**ITNs**) and the longitudinal planting of phytotelmas outside living premises.

The marked increase of **8.111 (R)** and **8.444 (I)** as against **6.333(N)** on the prevalence of malaria between health centres and months in the month of August could be due to the increased unregulated growth of these water bearing plants within the close neighbourhood in the Rumuiji and Ibaa communities. Also, mosquitoes are known to show penchant to water between certain physicochemical parameters (suitable pH, optimum temperature, dissolved oxygen, etc.) (Oyelami et al., 2010, Afolabi, 2013). This may have given rise to abundance of larvae of the mosquitoes and distribution in their breeding habitats since these water bearing plants play an economic importance to the inhabitants, thus, not been hewed down, always. For example, soil surface water retention dimensions could lead to flooding (depending on the topography, landscaping, anthropogenic factors etc.) which predisposes mosquito breeding (Munroe, 2019). Also, population drift from Port Harcourt and other adjoining communities to Ibaa and Rumuiji during the recessive period of the cult related crises may have further contributed to the increased prevalence in addition to other anthropogenic factors. Therefore, the expected “August Break” to creating reduction in the prevalence as observed in Ndele is a confirmative of the weather variability per month.

The spatial variation in the mean prevalence among health centres showed no significant relationship across months in all the three (3) health centres except the month of August (GPC) which differs significantly. This is evident by the test of homogeneity using single factor ANOVA. The observed no significant relationship was catalyzed by same season (rainy season) occurrence. The implication of this in terms of treatment, prevention and control strategies is that same strength and phenomenon can be applied across the three (3) health centres: **MPHC-N**, **MPHC-R** and **MPHC-I**, respectively, as the health centres appeared to have same feature during the rainy season.

The most vulnerable age group in this study are GPA (0-5yrs), GPD (16-20yrs) and GPI (40⁺). This is evident as the three-dimensional factors: host factor (immunity), disease carrying agent (Mosquito-Plasmodiasis) and environmental (physical, biological, phytotelmas, poor sanitation etc.) could possibly facilitate the processes while the least vulnerability age group is GPC (11-15yrs).

5.2 Recommendations

In view of the findings in the study, the following propositions were reached:

1. There should be enlightenment and sensitization awareness campaign on the public health impact of these phytotelmas when planted within neighbourhood.
2. Farmers should be encouraged to plant all phytotelma far away from the community.
3. Stakeholders (opinion leaders, youths, Chiefs, CDC, etc.) of the communities be involve in the rural sanitation exercises with an intent to eliminate the breeding space(s) of the mosquitoes.

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Administrative Competencies of Principals in Public Secondary Schools in Rivers State

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Abstract

The study investigated the competency needs of principals for effective school administration at public secondary school level. Three (3) research questions and three (3) corresponding hypotheses were used. A-30 item validated questionnaire was used for data collection with a sample of 100 principals selected from 100 public secondary schools. Descriptive statistics of Mean and Standard Deviation were used for data analysis. Results revealed that the instructional leadership skills needed by principals for effective competency in school's administration include principal's co-operation with teachers, effective supervision of lesson plans, teaching and learning activities, evaluating curriculum plan and implementation. The major personnel management skills needed by principals for effective school administration were motivation of staff and encouraging staff professional development, communicating among others. The study also found that the financial management skills needed by principals were joint preparation of budget with the management staff sourcing for funds and keeping accurate financial information. It was recommended that Principals should define objectives with teachers as teachers would be committed in their jobs to ensure that the objectives are achieved as they participate in deciding the objectives.

Keywords: administrative, competency, principal, public secondary schools

Introduction

Education in all countries of the world has been considered very important for personal and societal development. It is in view of the indispensable role of education in development of man and modern society that various declarations on education have been made both at the global level and in Nigeria. Considering governments' huge investment in public education, its output in terms of students' observable decline in performance, attitude and values have been at variance with government expenditure. It appears as if this unpleasant situation is not a reflection of the instructional quality in the school. Uke (2000) and Ibukun (2003) attributed the failure of educational programmes in Rivers state to several factors which includes shortage of teachers, inadequate training and poor motivation of teachers, lack of basic infrastructure, lack of leadership and administrative will, lack of accurate statistics, inadequate funding, embezzlement, poor attitude to work and bureaucratic bottle-neck among others.

Balci (1988) in a study carried out in Turkey noted that principals require some basic competencies to be able to succeed. Having the administrative competency especially in instructional leadership organizational development and creating a positive school culture, it is considered that principals can function better in schools in terms of student outcome. Valentine

(1989) opined that organizational development provides insight into the principals' work in the school to establish processes and relationship that most effectively promote growth and change of school. In this respect, the factors in the organizational development are organizational directions and procedures. Blumberg and Greenfield (1980) assert that the school principal is the most important and influential individual in any school being responsible for all the attitudes that occur in and around the school building in many ways. Here, the principal occupies a most strategic position in the school organizational development and change. It is their leadership that sets some of the school, the climate for learning, the level of professionalism, morale of teachers and the degree of concern for the students may or may not become. The bridge between the school and the community and the way they perform in that capacity largely determines the attitudes of students and parents about the school.

In an effective school, the principals articulate its major purpose and undertake systematic dissemination (Brandt, 1982, Clark, Lotto, & McCarthy, 1982). Here, they create a safe, organized and student-centered environment, identify and obtain the resources, organise people, programs, and activities to meet school goals; develop and maintain both operational and instructional school to support school vision and objectives; anticipate obstacles and prepare appropriate contingency plans (Williams, 2000).

Decision-making as an integral part of planning is a very crucial for the success of instructional management. It is therefore imperative that school principals be very knowledgeable on how and when to make important decisions for effective school administration. Odele as cited in Peretomode (1998) agreed that principals as chief executive officers in secondary schools should possess skills for making right decisions that will be of benefit to the students, members of staff and the school. Chukwu, (2003) posited that for a result-oriented school to be achieved, the teachers need to be motivated using democratic leadership skill by the head teacher, full involvement of the teachers in programme development, employment of adequate qualified teachers and provision of adequate teaching materials must be ensured. Ngoka (2000) and Adegbelemile (2004) opined that workers will be more productive if they have the opportunity of meeting their needs while working in an organization with improved conditions of service such as prompt payment of appreciable salaries and opportunities for in-service training among others. In addition, Ibukun, (2003) asserted that communication skills, leadership skills and decision making skills are essential for effective management as prudent management of resources is one of the major qualities of school heads. The success of any school programme depends very much on the way the human and material inputs are managed. Ogbonnaya, (2000) noted the central purpose of the financial management in the raising of fund and ensuring that the funds so mobilized are utilized in the most effective and efficient manner. There are various facets of leadership and one of the most important at the school level is the instructional leadership.

Instructional Leadership focuses heavily on coordinating, controlling, supervising, and developing curriculum and instructions in the school (Hallinger, 2006). Hallinger (2004) proposes the dimensions of the instructional leadership such as defining the school's mission, managing the instructional program, and promoting a positive school learning climate. In this regard, they are supposed to be goal-oriented and focus on the improvement of students' student outcomes. Several researches indicate that school principals contribute to school effectiveness and student achievement indirectly through actions they take both in the school and the classroom. The most influential avenue of effects concerns the principals' role in shaping the purpose of the school (Bamburg & Andrew, 1990; Goldring & Pastemake 1994). The actual role principals play in the mission building is influenced by features of the school context such as socio-economic status and school size (Drydale et al., 2009; Hallinger & Heck 2002; Hallinger & Murphy, 1986; Hallinger & Heck 1996). They are expected to create an academic process that fosters high expectations and

standards for all students as well as for teachers (Mortimore, 1993; Chase & Kane, 1983; Parthey & Smith, 1984; Tenosky, 2014). Instructional leaders have the following key elements.

Collaborating school culture is associated with the achievement of number of school reform objectives for both teachers and students (Leithwood & Jartzi, 1990). It manifests itself in rituals, customs, stones, ways of treating each other and cultural artefacts like language (Stoll, 1999). In order words, it is a system of meaning that influences how people think and how they act at school (Deros et al., 2004; Maslowski, 2001; Staessen, 1990). Here a positive or good school culture” is considered as one in which meaningful staff development and enhanced student learning are practiced (Engel et al., 2008).

Common features of school cultures in which professional learning and commitment to enhance students learning are a share sense of purposes and values, norms of continuous learning and improvement, collaborative collegial relationship and opportunities for collective problem-solving and sharing experiences (Deal & Peterson, 1998; Fallan, 2001). It is a multifaceted concept comprised of goal orientedness, participative decision-making, innovativeness, leadership, and cooperation between teachers. It appears that the administrators charged with the task of utilizing available scarce resources in Secondary Schools in Rivers State are not competent. This study thus, investigated the administrative competencies of principals in public secondary schools in Rivers state.

Methodology

The study adopted a descriptive survey design. The study was guided by three (3) specific objectives and three (3) corresponding research questions. Three (3) null hypotheses were tested at 0.05 level of statistical significance. The stratified random sampling technique was used to select 100 public secondary schools in Rivers State. The principals (100) of the selected schools were used as sample for this study. The instrument for data collection was a-30 item self-structured and validated Competency of Principals Survey Questionnaire (CPSQ). The reliability index of the instrument was 0.8 using the Pearson Product Moment Correlation Coefficient. Copies of the instrument were served directly on the respondents during meetings in order to reduce misplacement errors. Descriptive statistics of Mean and Standard Deviation was used to analyze data obtained from the field survey. Descriptive Statistics involving the use of mean and standard deviation was used to answer the research questions.

Results

Table 1: Mean score on instruction leadership skills needed by the principal for effective school administration.

S/N	Items	Mean	SD	Remarks
1.	Principal in cooperation with 15 teachers define objective for the school and each department and unit.	3.35	1.08	Agreed
2.	Principal jointly with teachers selected learning experience method and procedure to employ in achieving the objective.	3.14	0.99	Agreed
3.	Principal assign subject and class to the teachers according to their qualification and competence.	3.72	0.70	Strongly agreed
4.	Principal allocates time to subjects.	3.31	0.80	Agreed
5.	Principal make facilities availableand accessible to all teachers.	3.68	0.61	Strongly agreed
6.	Principal ensures that the staff in different units and work position, work cooperatively and not antagonistically far from the common goal of the school.	3.83	0.39	Strongly
7.	Principal supervises the teachers lesson plan.	3.29	0.83	Agreed
8.	Principal supervises teaching and learning activities in the classroom.	3.52	0.53	Strongly agreed
9.	Principal evaluates the planning and implementation of curriculum programmes.	3.10	1.06	Agreed
10.	Principal assist teachers to try new research findings.	3.21	1:01	Agreed

Table above showed that the principals perceived all the items as instructional leadership skills needed for effective schools administrative as all the items has means about 2.50 cut off point on a four-point likert scale item. 6 had the largest means scores of 3.83. This implies that the principal considering it as a very instructional leadership skill for effective school administration.

Table 2: Mean scores on personnel management skill needed by principal for effective schools administrative

S/N	Items	Mean	SD	Remarks
1.	Principal model behaviour he expects from others.	3.81	0.50	Strongly Agreed
2.	Principal identifies what motivate his staff.	3.71	0.51	Strongly Agreed
3.	Principal communicates effectively with his staff.	3.81	0.46	Strongly Agreed
4.	Principal recognises the effort of his staff.	3.77	0.47	Strongly Agreed
5.	Principal delegates duties and authority to capable staff.	3.83	0.45	Strongly Agreed
6.	Principal involve staff in decision and matter concerning them.	3.63	0.49	Strongly Agreed
7.	Principal praise in public, criticizes only in private.	2.76	0.89	Agreed
8.	Principal motivates, encourages, and cajoles his staff.	3.41	0.55	Agreed
9.	Principal encourages and enable appropriate professional development of staff.	3.39	0.51	Agreed
10.	Principal defuses tense situations and negotiates a solution.	3.63	0.49	Strongly agreed
11.	Principal does not take side in conflict resolution.	3.83	0.45	Strongly Agreed

Results in table 2 above showed that all the personnel management skills in the table are needed by principals for effective school administration. Each of this skills had a means score above the 2:50 cut-off point on a four point likert scale items 5 and 11 had equal and highest mean score of 3.83 each showing that the principals perceiving the skill as very essential personnel management skills needed by principals for effective school's administration on the other hand, items 7, had the lowest mean score of 2.76 indicating that the principals considering the skills less important personnel management skill needed by principal for effective schools administration.

Table 3: Means scores can financial management skills needed by principals for effective school's administration.

S/N	Items	Mean	SD	Remarks
1.	Principal jointly with the management staff and heads of departments and units, prepares budget for the school.	2.68	1.03	Agreed
2.	Principal priorities financial allocation according to needs.	3.29	0.71	Agreed
3.	Principal plans and sources for funds for school improvement.	3.27	0.81	Agreed
4.	Principal ensures that budget reflect agreed goals and objectives.	3.49	0.54	Agreed
5.	Principal delegates the mechanism of financial matters to capable staff.	3.14	0.76	Agreed
6.	Principal keeps close check on financial matters delegates to staff.	3.43	0.58	Agreed
7.	Principal works within the constraints of the school budget.	3.63	0.58	Strongly agreed
8.	Principal keeps account financial information about the school.	3.75	0.52	Strongly agreed
9.	Principal gives true and fair view of the financial position of the school.	3.87	0.52	Strongly agreed

Results in table 3 showed that all the financial management skills in the table are needed by the principal for effective school's administration. Each of the items had a mean score above the 2.50 cut off points on a poor point likert scale items 9 had the highest mean score of 3.87 showing that the financial management skills highly needed by the principals for effective school administration. However, the table also shows that the principal did not consider items 1 a very essential management skill competency needed by the principals for effective school's administration as the item had lowest mean score of 2.68.

Discussion of Findings

The study investigated the administrative competency of principal in public secondary school in Rivers State. Several results were obtained through this research. According to the findings from this study, the instructional leadership skills needed by principals for effective schools administration include principal co-operation with teachers in defining objectives for the school, selecting learning experience, method and procedures to achieve the objective assigning subjects and class according to qualification and competence allocating time to subject, making facilities accessible to all teachers according to need. It also includes ensuring that all members of staff work cooperatively for the common goal of the schools, supervising lesson plans, teaching and learning activities, evaluating the plan and implementation of curriculum programmes and assisting teachers to try new findings:

These findings are not surprising because the success of any human endeavour depends on the competencies and skills possessed by the persons who perform the tasks necessary for the achievement of purpose of objectives. The findings of this study agreed with (Mgbodile, 2003) who reported that for effective school administration, school administrators must possess and

employ planning and decision making skills leadership competencies supervisory skills and skills for school climate management.

Findings from the study also showed the personnel management skills needed by principal for effective public schools' administration to include – principals identifying what is capable of motivating their members of staff, recognizing the efforts of his staffers, motivating the staff involving staff in decision – making on matter concerning them communicating effectively with the staff professional development. These findings equally are not unexpected as indeed successful administrators are these who know how to motivate their staff to make them cooperative and loyal. These finding agreed with (Ibukun, 2003) who affirmed that there is no amount of capital injection into educational system without a change of attitude. Better skill acquisition and overt commitment on the part of the teaching force that can produce the much-desired change in school performance. This findings agreed with (Adegbemile, 2004) who reported that encouraging staff professional development help teachers to improve on their weakness. Other personnel management skills needed by principals for effective public secondary school's administration, as revealed in the result of the study are principal modelling behaviour expected from others, principal defusing tense situation and negotiating solutions, not taking side in conflict resolution. These findings agreed with (Ngoka, 2000) who reported those behaviour that demonstrate leadership, competency and conflict management skills which include among other sets expectation, models behaviour expected from others does not take side, negotiate to achieve resolutions which timely resolution of conflicts bring harmony co-operation unity, job satisfaction and good job performance.

Lastly, findings from the study also indicated that the financial management skills needed by principals for effective public schools administration are principal prioritizing financial allocation according to needs, ensuring that budgets reflect agreed goals and objectives, delegating the mechanism of financial matters to capable staff, keeping close check on financial matters delegated to staff, working within the constraint of the school budget, planning and sourcing for funds for school development, accurate financial information about the school gives true and fair view of financial position of the public secondary school. These finding ought to be so because such financial management skill are needed by the school principals to make them effective in planning, sourcing and utilization of school funds.

Conclusion

The major objective of this study was to investigate the administrative competency of principal in public secondary schools in Rivers State. The study revealed that the instructional leadership skills needed by principals for effective competency in school's administration include among others principal co-operation with teachers to define objective principal providing facilities, supervising lesson plans, teaching and learning activities, evaluating curriculum plan and implementation. It was also shown from the results of the study that the major personnel management skill needed by principals for effective school administration are principal motivating staff, encouraging staff professional development communicating effective with staff resolving conflicts. It was equally revealed from finding of the study that the financial management skills principals needed for effective school administration among others include: principal preparing budget joint with the management staff sourcing for funds, keeping accurate financial information, giving true and fair financial of the school.

Recommendations

Based on the findings and conclusion of this study, it is recommended that:

1. Principals should define objective with teachers as teachers would be committed in their job to ensure that the objectives are achieved.
2. Principals should keep accurate financial information of the school by giving true and financial position of the school would serve as “curtain raiser” for the non-governmental organizations, individuals and government to give out funds to school development.

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Knowledge and Practice of Drug Abuse among Commercial Motor Drivers in Port Harcourt Metropolis, Rivers State

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Abstract

This study assessed the knowledge and practice of drug abuse among commercial motor drivers in Port Harcourt Metropolis, Rivers State. The research design used was descriptive survey. The population for this study was 500 registered commercial motor drivers (CMDs). A sample size of 300 drivers was purposively taken for the study. A validated self-structured questionnaire was used to collect data for the study. Reliability indices were obtained for knowledge ($r=0.72$) and practice ($r=0.68$). Analysis of the data was done using a frequency table, percentage and analysis of variance for test statistics. Findings were that CMDs had good knowledge of problems associated with drug abuse. There was no significant difference in knowledge of drug abuse among commercial motor drivers based on age and educational qualification. However, there was significant difference in knowledge of drug abuse among commercial motor drivers based on experience. There was no significant difference in the practice of commercial motor drivers towards drug abuse based on age and educational status. However, there was significant difference in the practice of commercial motor drivers towards drug abuse based on years of experience. This study is expected to create new research areas on drug abuse and its effects. It was, therefore, recommended that commercial motor drivers should be advised to minimize the rate at which they use drugs to aid driving. The CMDs should not take alcohol shortly before and while driving. There should be training of CMDs on the dangers of using drugs while driving and legislation guiding sales of drug should be enforced. Public health workers and Road Safety Corps officials should regularly embark on enlightenment campaign against misuse of drugs by CMDs.

Keywords: knowledge, practice, commercial motor drivers, drug abuse, Port Harcourt.

Introduction

The use of drugs by individuals and society has aroused a great deal of concern in Nigeria. Production, sales and use of drugs, occupy the centre stage among the list of contemporary social problems in Nigeria. The extent and concern for this problem is indexed by drug prohibition agencies put in place to regulate and control the use, manufacture, importation, exportation and sales of drugs such as National Drug Law Enforcement Agency-NDLEA and National Agency for Food and Drug Administration and Control-NAFDAC. Drug is any chemical substance which when taken into the body of an organism modify one or more of its functions (Osa-Edoh & Egbo-Chukwu, 2012). It is also considered as a substance that modifies perceptions, cognition, mood, behaviour and general body functions. According to Achalu (2005), drug which includes medicines, non-prescribed drugs, illegal drugs, alcoholic beverage drugs, cigarettes, food additives, industrial chemicals, even food are potential poisons. Drug abuse is rapidly a growing

global public health problem. The problem of drug abuse places a significant threat to the health, social and economic wellbeing of families, societies and the nations (Giade, 2012; Oshodi et al, 2010). From a legal perspective, drug abuse refers to any use of an illicit drug such as Indian hemp, cocaine, heroin, etc. It also refers to the use of a licit drug by those prohibited by the norms of a group or society e.g. children within a particular age bracket prohibited from drinking alcohol. World Health Organization-WHO (2009) described drug abuse as a maladaptive pattern of substance use leading to clinically significant impairment or distress as manifested by one or more of the following occurring within a 12 month period; recurrent substance use resulting in the failure to fulfil major roles like obligations at work, school or in the home; recurrent substance use in situation in which it is physically hazardous, for example driving automobile when impaired by substances used; recurrent substance use related to legal problems; and continued substance use despite recurrent social and interpersonal problems.

Almost every country in the world is affected by one form of drug abuse or the other by its citizens (United Nations Office on Drugs and Crime-UNODC, 2007). The increase in drugs abused globally has brought problems such as increase in violence and crimes, increase in HIV/AIDS with other diseases, and collapse in the social structure (UNODC, 2007; Oshodi et al, 2010). The most commonly abused drugs are the psychoactive drugs or mind-altering drugs that affect our thinking, feelings and behaviour. Payn et al (2009) classified them as follows: (1) Stimulants such as cocaine and amphetamine (2) Depressants like barbiturates and benzodiazepines (like ativan) (3) Hallucinogen such as mescaline, payote and other designer drugs; (4) Cannabis like marijuana and hashish oil; (5) Narcotics like opium, heroin, morphine and codeine; and (6) Inhalants such as aerosols, solvents, petroleum products among others. Abuse of stimulants causes harmful nervous exhaustion; high dose of amphetamines, for example, can cause violent behaviours and mental illness such as psychosis; other hazards of stimulants are heart problems, convulsions, respiratory paralysis and death, infections, mal-nutrition, ulcer, among others (Achal, 2005). The impact of drug abuse among Nigerians has been a feature of a morally bankrupt, corrupt and wasted generation and loss of our societal values and ideals. According to Giade (2011), any nation being used by drug barons as a transient route has the potentials of becoming a drug abuser consumer's country; drug abuse threaten the security of every nation, tearing apart our societies, spawning crime, spreading diseases such AIDS, and killing (Jacob, 2012).

Some 200 million people or 5 percent of the world's population aged 15 – 65 years have used drugs at least once in the last 12 months; about 15 million more than the previous years in all nations has increased in recent years; this report goes on to note that the increasing availability of drugs to an ever widening socio-economic spectrum of consumers is disconcerting, although the main problem at global level continues to be opiates (notably heroine) followed by cocaine (Ekpenyong, 2012). From the records of drugs abused in Nigeria, the Northwest has a statistics of 37.4% of the drug victims in the country, while the Southwest has been rated second with 17.32%, the Southeast has been rated third with 13.5%, North-central has 11.71%, while the Northeast zone has 8.54% of the drug users in the country (Akannam, 2008). In Nigeria the estimated life time consumption of cannabis among the population is 10.8%, followed by psychotropic substances like benzodiazepines and amphetamine-type of stimulants 10.6%, heroin 1.6%, and cocaine 1.4%, in both urban and rural areas. Drug abuse appears to be common among males with 94.2% and females 5.8%, and the age of first use is 10 to 29 years (UNODC, 2007). The use of volatile organic solvents is 0.53%, and is widely spread among the street children, in-school youths and women. Multiple drug use happens nationwide with 7.88% to varying degree (UNODC, 2007). Worldwide, the number of people killed in Motor Vehicle Accidents (MVAs) each year is estimated at almost 1.2 million, while the number injured could be as high as 50 million. Causes of MVAs are varied and

multi-factorial and it is likely that use of psychoactive substances is likely to play a major role. Globally, more than five million deaths per year are the result of direct tobacco use while more than 600,000 are the result of non-smokers being exposed to second-hand smoke (WHO, 2013). Alcohol consumption, on the other hand, is responsible for the death of approximately 3.3 million people every year representing 5.9% of all deaths (WHO, 2014). Studies in Nigeria and other countries have shown a high prevalence of use of psychoactive substance among various categories of drivers. The use of these substances has been associated with the occurrence of MVAs. (Adekoye et al, 2011)

Based on observations of authors and researchers the commonly abused drugs by Commercial Motor Drivers (CMDs) can be broadly categorized as natural products and gateway drugs. They are easily obtainable legal or illegal drugs such as alcohol, tobacco, marijuana, nicotine, codeine and steroids, whose use may be preceded by the use of harder drugs or less common illegal drugs. Naturally-occurring drugs include the use of leaves, seeds, roots etc. sometimes in a way that is different from what society accepts. For instance pawpaw leaf is traditionally appreciated for its medicinal value in the cure of fever and general weakness of the body but some CMDs especially in the South-Western Nigeria exploit its dried leaf by either smoking it alone or roll it with cigarette or marijuana; its effect on the mood is thus said to be higher than cigarette but milder than marijuana. (Uzorka, 2014) Commercial motor drivers' abuse alcohol and tobacco and they all have short term and long-term consequences (Uzorka, 2014). According to Fayemi (2014), cannabis, is now as common as sachet water, can be easily purchased on the streets, bars and night clubs. Any quick visit to pharmacy will confirm that the craze for cough syrup is high. This is not because there is cough outbreak, but the stimulating effect of codeine in these cough syrups. Codeine which is derived from opium poppy and is related to morphine and heroin is being abused by Nigerian CMDs at an alarming rate.

Some causes making young people to be vulnerable to drug abuse in Nigeria include curiosity and desire (Experimental Basis), peer-group influence, promotion (Media Impact), availability, self-medication, pathological family background (Inherited Vulnerability), ignorance of dangers of illegal drug use, and community standard (Oshodi et al, 2010; Igwe et al, 2009; Abudu, 2008; Desalu et al, 2010; Ajibulu, 2011). Other reasons why commercial motor drivers often indulge themselves in drug abuse of alcohol beverages and tobacco are boredom and anti-social behaviour. In light of the above, the researchers resolved to investigate "Knowledge and practice of Drug Abuse among Commercial Motor Drivers in Port Harcourt Metropolis, Rivers State".

Specific objectives

The study was guided by the following specific objectives:

1. To determine the knowledge of commercial motor drivers on drug abuse based on Age, Educational qualification and Years of experience.
2. To investigate the practice of Commercial Motor Driver towards Drug Abuse based on Age, Educational qualification and Years of experience.
3. To find out the most commonly abused drug among Commercial Motor Drivers (CMD).

Research Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance:

1. There is no significant difference in knowledge of drug abuse among commercial motor drivers based on age.
2. There is no significant difference in knowledge of drug abuse among commercial motor drivers based on educational qualification.

3. There is no significant difference in knowledge of drug abuse among CMDs based on years of experience.
4. There is no significant difference in the practices of commercial motor drivers on drug abuse based on age.
5. There is no significant difference in the practices of commercial motor drivers on drug abuse based on educational qualification.
6. There is no significant difference in the practices of commercial motor drivers on drug abuse based on years of experience

Methodology

The research applied a descriptive survey design. It was a retrospective study that took place in 2015. The study targeted a population of 500 registered commercial motor drivers from all parts of Port Harcourt Metropolis.

Taro Yamane's formula, $n = \frac{N}{1 + N(e)^2}$

was used to derive a sample size of 222. This was purposively increased to 300. Nwankwo (2010) posited that it is advisable to use the sample size higher than the minimum estimate given by the formula. Proportionate stratified random sampling technique was used to select the numeral (300 commercial motor drivers). A validated and pre-tested, self-structured questionnaire was used as the instrument for data collection. With the help of two research assistants, a total of three hundred (300) copies of the questionnaire were administered. Two hundred and seventy-four copies of the completed questionnaire were retrieved representing 91.3% retrieval rate. Frequency count and percentages were used to present the data to obtain the result for the commonly abused drugs among Commercial Motor Drivers (CMDs) in Port Harcourt Metropolis. Analysis of variance (ANOVA) was used to test the hypotheses at a significant level of 0.05. Statistical Package for Social Sciences (SPSS) instrument was used for the analysis.

Results

Tables 1 – 7 contained the information showing the commonly abused drugs, and statistical analysis results for the knowledge and practice of drug abuse among CMDs in Port Harcourt Metropolis towards drug abuse based on age, educational qualification and years of experience respectively. The Null Hypotheses were all read and applied accordingly.

Table 1: Summary of ANOVA on the difference in knowledge of drug abuse among commercial motor drivers based on age

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.202	3	.067		1.612
Within Groups	11.299	270	.042		
Total	11.502	273			

Table 1 showed that there is no significant difference in knowledge of drug abuse among commercial motor drivers based on age ($F_{3, 270} = 1.612, p > .05$). The null hypothesis one was rejected at .05 level of significance.

Table 2: Summary of ANOVA on the difference in knowledge of drug abuse among commercial motor drivers based on educational status

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.316	3	.105		.057
	2.540				
	11.186	270	.041		
Within Groups	11.502	273			
Total					

Table 2 showed that there is no significant difference knowledge of drug abuse among commercial motor drivers based on educational qualification ($F_{3, 270}=2.540, p>.05$). The null hypothesis two was rejected at .05 level of significance.

Table 3: Summary of ANOVA on the difference in knowledge of drug abuse among commercial motor drivers based on experience

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.909	3	.303		.000
	7.723				
	10.593	270	.039		
Within Groups	11.502	273			
Total					

Table 3 showed that there is significant difference knowledge of drug abuse among commercial motor drivers based on experience ($F_{3, 270}=7.723, p<.05$). The null hypothesis three was accepted at .05 level of significance.

Table 4: Summary of ANOVA on the difference in practice of drug abuse among commercial motor drivers based on age

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.202	3	.067		.187
	1.612				
	11.299	270	.042		
Within Groups	11.502	273			
Total					

Table 4 showed that there is no significant difference in the practices of commercial motor drivers on drug abuse based on age ($F_{3, 270}=1.612, p>.05$). The null hypothesis four was rejected at .05 level of significance.

Table 5: Summary of ANOVA on the difference in practice of drug abuse among commercial motor drivers based on education

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.316	3	.105		.057
2.540	11.186	270	.041		
Within Groups	11.502	273			
Total					

Table 5 showed that there is no significant difference in the practices of commercial motor drivers on drug abuse based on education ($F_{3, 270}=2.540, p>.05$). The null hypothesis five was rejected at .05 level of significance.

Table 6: Summary of ANOVA on the difference in practice of drug abuse among commercial motor drivers based on experience

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.909	3	.303		.000
7.723	10.593	270	.039		
Within Groups	11.502	273			
Total					

Table 6 showed that there is significant difference in the practices of commercial motor drivers on drug abuse based on years of experience ($F_{3, 270}=7.723, p<.05$). The null hypothesis six was accepted at .05 level of significance.

Table 7: Most commonly abused drugs among commercial motor drivers

Drugs abused	Responses, N(%)				
	Alcohol	Tobacco/ snuff	Kola nut/bitter	Indian Hemp	Dry gin/(hot drink)
	49(17.89)	63(22.99)	Kola 80(29.20)	28(10.22)	54(19.70)

Table 7 showed that the most commonly used drug was kola nut/bitter kola, representing about 29.2% of the abused drugs. This was followed by tobacco or snuff, representing about 23.0%. The least abused drug was Indian hemp representing about 10.2%.

Discussion of Findings

Knowledge of Drug Abuse among Commercial Motor Drivers

The study finding showed that the subjects have a good knowledge of drug abuse. When put to statistical test as in Tables 2 and 3 respectively indicated that there was significant difference in knowledge of drug abuse among commercial motor drivers based on age and educational qualification. However, there is no significant difference in knowledge of drug abuse among

commercial motor drivers based on experience (Table 4). The present finding is inconsistent with the findings of Embleton, Ayuku, Vreeman and Braitstein, (2012) who established that 61% of their respondents were not knowledgeable about drug abuse, because the respondents was never taught the dangers of using drugs. Adebowale et al (2013) found the level of knowledge of the students concerning drug abuse to be fair and the drugs mostly used were the socially acceptable ones; but they are likely to lead to the use of stronger ones later in life.

Practice of drug abuse among commercial motor drivers

That the subjects strongly practice drug abuse was noted in this research. When put to statistical test as in Tables 5 and 6 established that there was significant difference in the practices of commercial motor drivers on drug abuse based on age and educational status. However there was no significant difference in the practices of commercial motor divers on drug abuse based on years of experience (Table 7). The present finding is inconsistent with the earlier findings of Oshikoya and Alli (2006) who established that 33.6% of the respondents were currently taking one or more drug abuse, as a result of the population of the study. On practice of drug abuse Tuttle et al (2010) reported on rate of substance abuse in the USA as 10%. Similarly, Arora et al (2016) in India 20% rate of substance abuse including participants using alcohol, cigarettes, cannabis, bhang, tobacco (chewing), and other substances (gel and drugs). Jalilian et al (2015) noted relatively lower rate than other substance abuse (especially smoking (19.4%) and alcohol drinking, 10.1% in Iran.

Most commonly abused drug among Commercial motor drivers in Port Harcourt Metropolis

The finding from Table 1 showed that most commonly used drug was kola nut/bitter kola. This was followed by tobacco or snuff, and the least was Indian hemp. The present finding is inconsistent with the earlier findings Sofela et al (2013) who established that 22.6% and 10% of their respondents mostly abused cannabis and stimulant respectively, as a result of their level of awareness.

Recommendations

Based on the findings of the study the following recommendations were made:

1. Commercial motor drivers should be advised to minimize the rate at which they use drugs to aid driving. They should not drink while driving.
2. Health workers should be made to go and train the CMDs on the dangers of using drugs while driving as this could go a long way to reduce the prevalence of drug abuse among commercial motorists.
3. Health education by specific preventive measures such as screening programmes to detect alcoholism syndrome.
4. Drug and alcohol education should be taught in schools through curriculum and drug abuse days.
5. Legislation guiding sales of drug should be enforced.
6. The public should be educated and the sale of drug should be monitored.

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Effects of Child Abuse on the Girl-Child in a Rural Area of Rivers State

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Abstract

This study determined the effects of child abuse on the girl-child in a rural community of Rivers State. This paper specifically considered impaired child development, physical and psychological effects. Study design adopted was descriptive survey. The study population was 852 and sample size of 187 derived. A multi-stage sampling procedure was adopted. The questionnaire was used as the instrument for data collection with a reliability index of 0.70. The findings of the study revealed persistent delay in starting school, poor school attendance, inadequate cognitive ability and dropping out of school as the developmental side effects of girl-child abuse. Increased juvenile delinquency in physical injury and recurring body scar were the major physical effects of girl-child abuse; possible entry into a condition of depression, likely rejection by family or loved ones and 'low self-esteem' were the notable effects of girl-child abuse. Therefore, the study recommended that parents/guardians should be advised to avoid acts that will result in girl-child abuse; parents and guardians need to protect their children against any form of child abuse in order to remain free of the mental and physical adverse health effects; and there should be interventions on the part of government, NGOs or individuals in a bid to prevent child abuse on a girl-child.

Keywords: child abuse, girl-child, effects, impaired development, rural community

Introduction

Child abuse is a major public health and social welfare problem. Child abuse with its adverse effects on the individual has been revealed to be a major problem (Norman, 2012). It includes psychological abuse, physical abuse, sexual abuse and neglect (Hussey et al., 2006). But neglect is the most common form of child abuse, followed by physical abuse, sexual abuse, and psychological abuse (U.S. Department of Health & Human Services et al, 2020). Boys and girls experience similar rates of childhood abuse, 48.6% and 51% respectively (The National Resource Center for Reaching Victims, 2018). Children younger than one year old are the most vulnerable to maltreatment, accounting for almost half of child fatalities from abuse in 2018 (U.S. Department of Health & Human Services et al., 2020). Rates of child abuse and neglect are 5 times higher for children in families with low socio-economic status compared to children in families with higher socio-economic status (Centers for Disease Control and Prevention, 2020). Girl-child abuse can be seen as a situation whereby the fundamental human right of a girl-child is tempered with, for example, the girl-child is not given adequate care and protection as it is the responsibility of every parent to take

good care of their children. These rights are rights to education, religion, freedom of movement, shelter etc (Awosusi & Adebo, 2012). Effective preventive programmes have been recommended to combat maltreatment occurrence (Wekerle, 2011).

Afifi et al (2014) had alluded to mental disorders as contributing to child abuse or maltreatment. It can cause death, disability, and long-term consequences that result in actual or potential harm to a child's health, development into adulthood and their dignity. A World Health Organization (WHO) 2006 report on children maltreatment stressed the need to draw public attention to its health and behavioural impact and that investment in resources is required to both monitor and prevent its occurrence. (Meng & D'Arcy, 2016) According to Gilbert et al (2009), it has been estimated that annually worldwide about 4–16 % of children are physically abused, 10 % are neglected or psychologically abused, 5-10 % of girls and up to 5 % of boys are subjected to penetrative sexual abuse. The American National Committee on Prevention of Child Abuse, in 2007 revealed that child neglect represented 54% of confirmed cases of girl-child abuse, physical abuse 22%, sexual abuse 8%, emotional abuse 4%, and other forms of maltreatment 12%. The girl-child abuse is far more common in single parent families than in families where both parents are present. (American Humane Association, 2011) The girl child on most occasions is exposed to sexual abuse and works in different sectors such as farms, domestic help, fishing and street hawking (Adegun, 2013). Healthy development of a child can be achieved through a healthy relationship with the parents but this relationship may not affect the current behaviour of the child while in other times it plays a critical role in the determination of future behaviour. Conversely, a parent-child relationship can develop negatively as a result of parental neglect and abuse (Aral, 2016).

Consequently, Gilbert et al (2012) observed that Childhood maltreatment significantly contributes to child mortality, morbidity, and other lasting effects on physical and mental health, school performance, alcohol and illegal drug misuse, and criminal behaviour. The abuse of a child by an adult, such as the mother, father or caregiver, inhibits and limits child development; such behaviour is also considered wrong or detrimental by social rules and professionals; and such actions or inactions physically, psychologically, sexually or socially harm the child as well as threatens his/her wellbeing and safety (Taner & Gower, 2014; Binder, 2017). Maltreatment towards children has a heavy cost on society, as it causes lifelong social and health problems among which cause several adverse effects such as psychological problem, developmental delay, post traumatic stress disorder, depression, low self-esteem, aggressive behaviour, and health problems such as pulmonary, hepatic and cardiovascular diseases, poor academic and work performance, learning disorder, difficulties in peer relationships and criminal tendencies, drug abuse (McCloskey & Walker, 2010). Being exposed to maltreatment in childhood will result in psychological health problems in adolescent and adulthood (Green, 2010). Shonk and Cicchetti (2011) relate that the current state of evidence for a link between girl-child abuse (physical and sexual abuse or neglect) and school performance is negative. Hussey et al (2006), Gilbert et al (2009) and Walsh et al (2010) in their studies on childhood maltreatment noted that child abuse is prevalent and has a significant consequence on psychological and health outcomes.

Furthermore, boys are identified to be more likely to have experienced physical abuse, but girls tend to have more negative consequences of physical abuse, and were more likely to be sexually abused (Afifi et al, 2014). According to Anda et al (2006), adverse childhood experiences are associated with enduring changes to the child's nervous, endocrine and immune systems. Steel et al (2014) in their systematic review, has recently projected the evidence in over 174 surveys across 63 countries that women were more likely to experience mood and anxiety disorders, whereas men were more likely to have substance use disorders. Based on the aforementioned

effects and the fact that there are no such studies with rural settings in this part of the country recently, the researchers resolved to investigate effects of child abuse on the girl-individual in a rural community of Rivers State.

Specific objectives

Specific objectives of the study were:

1. To identify possible impaired development of abused girl child in Agbalama community.
2. To determine resultant physical effects of girl-child abuse in Agbalama community.
3. To ascertain psychological effects of abused girl child in Agbalama community.

Research Questions

The following research questions guided the study:

- 1 What are the impaired child development effects of abused girl child in Agbalama community?
- 2 What are the physical effects of girl-child abuse in Agbalama community?
- 3 What are the psychological effects of girl-child abuse in Agbalama community?

Methodology

A descriptive research design was used in the study which fieldwork took place in late June, 2020. In Agbalama Community in Bonny Local Government Area of Rivers State, there were non-indigenous people who also speak Igbo, Ogoni, Obolo (Andoni), Efik/Ibibio and Kalabari languages as well as few visiting Hausas. The community population projection by 2020 is 852 projected from 1996 stated figure of 419 (National Population Commission, NPC, 1991). A sample size of 187 was determined using the percentage method (22% of 852). This method is in line with the submission of Nwanna (2006) as cited in Elechi (2012), and of Smith (2013). A validated and pre-tested self-structured questionnaire was the main instrument for data collection. A multi-stage sampling procedure was used to obtain the desired sample. One hundred and eighty-seven (187) copies of the questionnaire were served but retrieved 180 copies giving a retrieval rate of 96.3%. Data were summarized by tallying and coding, then presented in frequency tables. Weighted mean was mainly used for data analysis. Keys to abbreviations in Tables 1-3 are SA (Strongly Agree), A (Agree), D (Disagree), and SD (Strongly Disagree) along with numeral codes of 1-4 with the higher affirmative stand assigned the highest figure.

Results

Tables 1-3 contained the results which were in response to research questions 1-3. The analysis was carried out in a bid to achieve specific objectives 1-3.

Variable	Response frequency					Mean
	SA (4)	A (3)	D (2)	SD (1)	Total	
Persistent delay in starting school	80(320)	60(180)	15(30)	25(25)	180(555)	3.08
Poor school attendance	93(372)	40(120)	23(46)	24(24)	180(562)	3.12
Inadequate learning or cognitive ability	74(296)	51(153)	31(62)	24(24)	180(535)	2.97
Dropping out of school	70(280)	60(180)	22(44)	28(28)	180(532)	
Failure in many life success ramifications at adulthood	35(140)	44(132)	66(132)	35(35)	180(439)	2.96
Grand item wtd mean						2.44
						2.91

Table 1 indicated impaired child development effects of girl-child abuse. The criterion for decision-making has been fixed at 2.50 item weighted mean. On this basis prolonged delay in starting school (mean=3.08), poor school attendance (mean=3.12), inadequate learning/cognitive ability (mean=2.97) and dropping out of school (mean=2.96) have been admitted as effects of impaired child development.

Table 2

Physical Effects of Girl-child abuse

Variable	Response frequency					Mean
	SA(4)	A(3)	D(2)	SD(1)	Total	
Observed permanent/ 3.06 recurring body scar	75(300)	65(195)	15(30)	25(25)	180 (550)	
Possible appearance of skin ulcer	10(40)	15(45)	60(120)	95(95)	180 (300)	1.67
Occurrence of arthritis	47(188)	30(90)	53(106)	50(50)	180 (434)	2.41
Likely burnt body part	20(80)	16(48)	80(160)	64(64)	180 (352)	1.96
Onset of allergic reactions	37(148)	28(84)	60(120)	55(55)	180 (407)	2.26
Increasing juvenile delinquency in physical harm	90(360)	70(210)	6(12)	14(14)	180 (596)	3.31
Grand item wtd mean						2.45

Table 2 showed physical effects of girl-child abuse. The criterion for decision-making has equally been set at 2.50 item weighted mean. Therefore, permanent or recurring body scar (mean=3.06) and increasing juvenile delinquency in physical injury (mean=3.31) were obvious in this community. Even with grand item weighted mean of 2.45 sizeable numbers of respondents did not supposedly support appearance of skin ulcer, occurrence of arthritis, burnt body parts and onset of allergic reactions.

Table 3

Psychological Effects of Girl-child Abuse

Variable	Response frequency					Mean
	SA(4)	A(3)	D(2)	SD(1)	Total	
Enter into a condition of depression	73(292)	57(171)	45(90)	5(5)	180(553)	3.07
Have low self-esteem	51(204)	54(162)	40(80)	35(35)	180(481)	2.67
Rejection by family or loved ones	63 (252)	49(147)	30(60)	38(38)	180(497)	2.76
Remain nervous in conduct	40(160)	51(153)	26(52)	63(63)	180(428)	2.38
Lost ambitious zeal	26(104)	34(102)	38(76)	82(82)	180(364)	2.02
Grand item wtd mean						2.58

Table 3 showed psychological effects of girl-child abuse. Based on the criterion for decision-making (mean=2.50) respondents affirmed entry into a condition of depression (mean=3.07), rejection by family or loved ones (mean=2.76) and low self-esteem (mean=2.67).

Discussion

The abuse or neglect of children is tragically common worldwide today. Nor are most of us surprised when studies point to a strong link between the physical, sexual, or psychological maltreatment of children and the development of psychiatric problems.

Impaired child development effects of girl-child abuse

Perhaps childhood abuse has arrested psychosocial development, leaving a “wounded child” within the adult. In 1983, A. H. Green and his colleagues suggested that many abused children evidenced neurological damage, even without an apparent or reported head injury. The hippocampus, located in the temporal lobe, is involved in memory and emotion. Developing very gradually, the hippocampus is one of the few parts of the brain that continues to produce new cells after birth. Cells in the hippocampus have an unusually large number of receptors that respond to the stress hormone cortisol. Since animal studies show that exposure to high levels of stress hormones like cortisol has toxic effects on the developing hippocampus, this brain region may be adversely affected by severe stress in childhood. The findings of the study are highlighted below as it reflected the view of respondents to abuse of girl child in the present work.

The findings of the study on this specific objective were persistent delay in starting school, poor school attendance, inadequate learning/cognitive ability and dropping out of school as the main child developmental effects of a girl-child abuse. These were expected along with failure in some life success ramifications at adulthood. It appears longitudinal survey design would be able to

confirm the latter. The finding is also in line with the work of Ogundele and Ojo (2005) as well as Olusegun (2010) which examined the effect of girl-child abuse and differently concluded that it has negative developmental effects on the girl child (i.e.) poor school attendance, dropping out of school and persistent delay in starting school etc.

Resultant physical effects of girl-child abuse

The study had confirmed permanent or recurring body scars and increasing juvenile delinquency in physical injury as part of the physical effects of girl-child abuse. These findings were expected by the researchers. Other variables such as appearance of skin ulcer, occurrence of arthritis, burnt body parts and onset of allergic reactions relatively rejected by the respondents were equally doubtful to the researchers. Nevertheless, the findings actually agree with the study of Agu (2010) who examined effects of child abuse by adult in Owerre Urban of Imo State. He found that girl-child abuse has physical effects such as observed permanent/recurring body scars and increase in juvenile delinquency on the girl child. Another study conducted by Ojo (2013) which investigated the problem and physical effects of child abuse also proved that actually girl-child abuse has physical effects as highlighted in this study.

Psychological effects of girl-child Abuse

Lastly, this study indicated that entering into a condition of depression, rejection by family or loved ones and low self-esteem are among other main psychological effects of girl-child abuse. These findings were not all that were expected by the researchers who also felt that remaining nervous in conduct and loss of ambitious zeal could be part of the clear findings. These findings are again in agreement with the study of Chen and Paterson (2016) on social vices and dangers of girl child abuse. In their study, they confirmed that girl-child abuse has both physical and psychological effects on the girl child such as highlighted above by this study. Although the measurement of child abuse (including its subtypes) may be varied across studies, the major findings of this work on psychological effects are consistent with earlier research and literature. Studies have consistently showed that childhood abuse is associated with negative mental health outcomes, for example, internalizing disorders (Binder et al, 2008), externalizing disorders (Douglas et al, 2010), etc. There have been numerous studies into the negative impact of child abuse on psychological well-being (Maniglio, 2009), self-harm (Nickel et al, 2004 in Meng & D'Arcy, 2016), self-esteem (Griffing et al, 2006), life satisfaction (Roberts et al, 2004 in Meng & D'Arcy, 2016), etc. just as it has been done with the present study. In line with our study the WHO (2021) had stated that consequences of child maltreatment include impaired lifelong physical and mental health, and the social and occupational outcomes can ultimately slow a country's economic and social development.

Conclusion

Child abuse and neglect can have devastating and long-lasting effects on a child and worse still with the girl-child. The early experiences of girl-child abuse can trigger the development of an emotional disorder, such as anxiety and depression. Aside from the immediate physical injuries children can experience through maltreatment, a child's reactions to abuse or neglect can have lifelong and even inter-generational impacts. These consequences may be independent of each other, but they also may be interrelated. For example, abuse or neglect may stunt physical development of the child's brain and lead to psychological problems, such as low self-esteem.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Parents/guidance should be advised to avoid acts that will result in child abuse on a girl child with its attendant effects.
2. Parents and guardians need to protect their children/wards against any form of child abuse in order to remain free of the mental, physical and social adverse health effects.
3. There should be intervention on the part of government, NGO's or individual in a bid to prevent child abuse along with future societal complications.
4. A comparative study is necessary to determine both incidence and prevalence of girl-child abuse in rural and urban settings.

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Socio-Cultural Factors Influencing Maternal Health in Abuloma Kingdom of Port Local Government Area of Rivers State, Nigeria

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Abstract

Socio-cultural factors influencing maternal health have been a global health issue faced by mothers. This study specifically aimed at investigating the extent to which socio-cultural factors influenced maternal health of women residing in Abuloma Kingdom of Port Harcourt Local Government Area, Rivers State. The population for this study comprised women of child-bearing age (15 – 49 years). Cross-sectional design was employed; a multi-stage sampling technique was used to select three hundred and sixty (360) respondents. A semi-structured and validated questionnaire with reliability coefficient of 0.77 was used for collection of data. (61.1%) 220 of the respondents had experienced some form of violence, 120 (33.3%) had experienced violence from their husbands while (36.85%) 139 received violence from their in-laws. In conclusion, this study has shown that maternal health challenges in Abuloma Kingdom will continue to be a problem if adequate attention is not provided, especially in the area of social factors that have affected maternal health and the common cultural beliefs/practices that are associated with maternal health. It is therefore recommended that, policies on gender violence should be re-enforced in the kingdom. There should be targeted health policies towards the well-being of mothers during pregnancies at work place. Policies should provide flexible working hours for pregnant women, such as closing earlier than others to avoid the pressure on the road and to be able to attend to home activities, and also for them to have enough time to prepare and rest for the next day activities.

Keywords: socio-cultural, maternal, health, women, childbearing age.

INTRODUCTION

African continent is one of the largest continents of the world with many ethnic society and various practices (Ojua et al., 2017). Nigeria as a country is made up of people from different ethnic groups and cultural practices with the main groups being Igbo, Yoruba, and Hausa. She has more than 250 ethnic groups with different cultural practices. In Nigeria, whenever someone talks about cultural practice as it concerns health, the first thing that comes to the mind of the people is crude and rude practice. Not all cultural/traditional practices are bad. However, some have stood the test of time and have positive values, others are uncertain and negatively harmful (Idehen, 2007).

WHO (2010) reports that 15% to 71% of women around the world have suffered physical or sexual violence committed by an intimate male partner at some point in their lives. According to this report since 1980, rape rates have risen nearly four times as fast as the total crime rate. WHO (2010) observed that violence has serious health consequences for women ranging from injuries to unwanted pregnancies, sexually transmitted infection, depression and chronic diseases. Atama (2011) affirms that battered women are four to five times more likely than unbattered women to require psychiatric treatment and more likely to commit suicide. According to him, each year one

million women are sufficiently injured to seek medical assistance at emergency rooms for injuries sustained through fighting. In view of the extensive evidence, Atama calls it an over whelming moral, economic and public health burden that our society can no longer bear. He demanded a major response from government at the national, state and community levels, the clergy, non-governmental organizations as well as international organizations.

Another problem identified by Momoh et al. (2010) was postpartum infection which occurs after hospital discharge. This usually occurs 24 hours after delivery; therefore in the absence of postnatal follow-up as is the case in many developing countries, many cases of puerperal sepsis can be prevented through careful attention to antiseptic procedures during delivery, consumption of adequate nutritive diet/supplements especially those rich in proteins and vitamins during pregnancy.

The World Health Organization (2007) stated that the cultural practices of people not only affect their health but also affect all aspects of life including social relationship, contribution to societal functioning and disease condition. Man living in an interactive society is affected by what happens in his environment and how he reacts to it. All people no matter the race have their belief and practices concerning health and disease. Each society or community has its peculiar way of doing things and these practices go a long way in influencing the people's perception, attitudes and behaviour in the management of disease and health related problems that befall them (WHO, 2007). Culture is a way of life of a people. Therefore, the way of life of people can determine their development over time in all ramifications as compared to global growth and societal development (Obot, 2012).

Maternal health is the health of women all through pregnancy, childbirth, and the postpartum period. It encompasses the care dimensions of family planning, preconception, prenatal, and postnatal care in order to ensure a positive and fulfilling experience, in most cases, and reduce maternal morbidity and mortality, in other cases. In fact, maternal health could be defined as the opposite of maternal mortality and morbidity because women who are healthy stand a far better chance of thriving during and after pregnancy than women who are unhealthy. Cultural practices can expose women/girl to the health risks of early pregnancies that can lead to high maternal morbidity and mortality.

According to Noah (2006), drinking alcohol during pregnancy can cause physical and mental birth defects. The report shows that no level of alcohol use during pregnancy has been proven safe. Each year more than 50,000 babies are born with some degree of alcohol-related damages. In some traditional communities, girls are engaged in marriage at their very early ages of life (11-13) and they are usually exposed to the pressure of having male children not only to belong to the husband's lineage but also to secure access to inheritance. For instance, in the traditional community of Mbaise in Imo State, a woman who has 10 or more children is compensated with a cow on the 10th live birth.

Abdull (2013) also affirmed that a woman should not start having children too early in life because if a woman's body is not ready to receive pregnancy, there is the likely hood of complication. Definitely the under aged women are more susceptible to maternal morbidity. According to Galilie (2003), the nature of the work tasks and works organization is crucial both to personal wellbeing and to broader social cohesion. Countless women lack access to decent work that would enable them to rise above poverty and work in safe conditions. Many women workers have traditionally been concentrated in poorly paid, routine occupations. Many of these occupations fall outside traditional legal and social protection systems that safeguard against vulnerability and provide access to health care (ILO, 2010). However, in sub-Saharan Africa and South Asia, where the highest rate of maternal mortality are reported, more than 80 percent of women workers are considered to be working in precarious and vulnerable conditions, mainly

either in informal economy, lacking material protection at work, or certain industries, like medium size baby food, beverage and wine production companies that are always predominantly staffed with women. Not only are these women paid poorly, conditions in these part-time jobs time workers. The nature of these part-time jobs is such that women work longer hours for less pay. The need to bring in or supplement family income forces women to submit to these conditions. This is nothing but double exploitation (ILO, 2010). Women in many parts of the developing countries have been particularly affected by recent changes in economic policies, for example, the recent deregulation in the oil sector in Nigeria. This situation has forced these women to increase the number of hours in extra domestic activities and household tasks.

Abdul (2013) has also noted that family support networks are generally weaker in cities than in villages, leaving many women without support of the extended family in obtaining adequate antenatal and obstetric care. Social heterogeneity and stratification on the basis of ethnicity, occupation, neighborhood of residence and place of origin and other features are typically more common in cities. (ILO, 2010) clearly states that, while most attention to maternal health and mortality has justifiably focused on health services and family planning, mothers are also workers, with particular need of support to protect their health while working and to ensure their economic security during pregnancy and after childbirth. Available evidence demonstrates that in many developing countries women averagely work more hours per week than men when unpaid work and household activities are taken into account (Basu, 2011).

The problems associated with maternity and childbirth is closely linked to poverty, inadequate working conditions and gender inequality (ILO, 2010). For instance, for a woman, work is demanding and need more time. More time spent at work means less time available family life and rest. Where woman have paid job, as it has been recognized by Giddens (2010), companies are attempting to become more efficient and stream lined, jobs are cut or downsized and many employees experience anxiety about the security of their position. Meanwhile, according to ILO (2010), the importance of paid work in the lives of so many makes the quality of working conditions paramount to the reproductive health of women as well as men. Hostile working environment affect both men and women workers. However, there are specific dangers to which women workers face because of their biological makeup. The health impact of stressful events not only depend on the nature of these events but also on the individual ability to cope with the crisis and on the extent to which they receive social support from relatives, friends and other members of their social network (Stroebe, 2008).

In an impressive early survey, a relationship between social support and mortality was demonstrated. Strobe, (2008) studied social and community ties among a random sample of both women and men whose age varied from 30-69. Each of the four types of social relationship that was assessed at that time independently predicted the rate of mortality over the succeeding nine years. Individuals who were low on an overall social network index, and which weighed the intimate ties more heavily, had approximately twice the mortality risk of individuals who were high on this index over the nine year period. Those conjugal relations have a bearing on other aspects of a woman's life in particular and on the well-being of the family in general cannot be disputed. Indeed such aspects of conjugal relations as the intimacy between spouses and decision making process can be expected to influence women's health. Studies have shown the conjugal role deprivation, which was reflected in strained relationships within marriage, was felt among the women either because they did not secure the kind of husband or the type of marriage they wanted or because of divorce or an unhappy current marriage (Stroebe, 2008).

Recently findings, in acknowledging the fact that women who experience violence from their husbands are also less likely to have control over sexual activity or to be able to make decisions about the timing of childbearing, particularly in such a highly gender-stratified setting

(Stephenson et al., 2008). The feelings and fears experienced during pregnancy are intense and varied. These feelings and concerns are normal part of pregnancy. Each woman comes to terms with the changes in her own way, with the support of her partner or family (kitts et al., 2011). The extent to which individuals perceived that 50 supportive others are available will affect the coping process.

Ali et al. (2010) examined the factors constraining women's access to emergency obstetric services. Their analysis showed that poor hospital infrastructure, high staff absenteeism and geographical obstacles like distance and time to reach the facility cause many maternal deaths. Cultural factors such as female doctors should examine women; delayed access and unavailable human capital also endanger the life of mothers. The study reveals that the household economic status acts as the most important in affecting maternal health. The present study is related to Azim and Lofti (2011) is that both study focuses on the socio-cultural factors affecting maternal health.

Kowalewski et al. (2004) given the limitation of women earnings in both formal and informal employment and their complete exclusion from the cash economy in some cases, the extent to which poor women, particularly those who head household can afford expenditures (associated with health care) such as taking enough rest and eating balanced diet is questionable. Because of their economic status women over work themselves to support the family and this has adverse effect on their health. When a woman is malnourished, it results in anemia which increases the woman's susceptibility to illness, pregnancy complications and maternal death and ultimately leads to high death rates. For this reason, women in their reproductive years require three times as much iron a day as adult men too. A woman underdeveloped as a result from poor eating and weakened by anemia starts pregnancy in poor condition. Malnourished women are sick more; have smaller babies and die earlier. There is evidence that individuals who have a great deal of social support suffer a lower risk of physical impairment and mortality than individuals who have little social support (Stroebe, 2008).

Maternal mortality refers to deaths due to complications from pregnancy or childbirth. Even though, the United Nations International Children Emergency Funds (2011) reported that from 1990 to 2015, the global maternal mortality ratio declined by 44 per cent – from 385 deaths to 216 deaths per 100,000 live births, according to United Nation inter-agency estimates. This translates into an average annual rate of reduction of 2.3 per cent. While impressive, this is less than half the 5.5 per cent annual rate needed to achieve the three-quarters reduction in maternal mortality targeted for 2015 in Millennium Development. Maternal and infant mortality rates are social indicators used to measure the development of any country, and the situation in Nigeria is of great concern. In spite of resolution and adoption of the Sustainable Development Goals (SDGs), an effort by the United Nations enacted at the end of the Millennium Development Goals (MDGs) timeline in 2015.

Part of its major task is the improvement of the health of pregnant and nursing mothers (maternal health) and reducing maternal death. Despite this global commitment, the loss of women's lives resulting from complications during pregnancy has been on the increase in most sub-Saharan African countries. In Nigeria for instance, maternal mortality accounts for 59,000 deaths of women annually. Arguably, Nigerian women are 500 times more probable to lose their lives in childbirth when compared to most advanced nations of the world. He further noted that Nigeria is ranked second after India in global maternal incident rate and the worst in Africa. Furthermore, Nigeria's maternal mortality is reported to be 545 per 100,000 births. The prevalence of maternal mortality in Nigeria has become very disturbing as every birth procedure becomes a potential incidence, from the report above; there is at least one case of maternal mortality in every 20 live births. This challenge may not be unconnected to the nation's poor maternal health care system.

Maternal mortality and morbidity are some of the most important global health issues facing the world today. Worldwide, approximately 1000 women die each day from pregnancy and child birth related causes (WHO, 2010). In addition, 99% of these maternal deaths occur in the developing world, with sub Saharan Africa accounting for over half of these deaths (WHO, 2011). The international community has committed to improving maternal health with millennium development Goal (MDG) number five, which aims to reduce maternal mortality by three quarters by the year 2030 and reach universal access to reproductive health care and goal number 17; partnership of health and wellbeing with other sustainable development goals which are mainly aimed at decreasing 536,000 maternal deaths that occur every year in sub Saharan Africa (Magadi, 2007). Even with this commitment, many countries have failed to implement effective programs to reduce maternal mortality and morbidity, and women around the world continue to die or suffer from the complications of pregnancy and childbirth (WHO, 2010). Studies have shown that women of reproductive age in Africa are still not given opportunity to make their own decisions as most of them have low education level and considered low status in the society. Magadi (2007) mentioned that .in some cases women workers tend to be working in an unsecured and vulnerable environment either in the informal economy, lacking maternity protection at work or certain industries, like medium size baby food, beverage and wine production companies. They are not only low paid but these factories are terrible. Some women are not able to cope with stress and crisis because they do not receive social support from relatives, friends and other members of their social networks.

Research Questions

1. What are the social factors influencing maternal health in Abuloma kingdom.
2. What are the cultural factors influencing maternal health in Abuloma kingdom.
3. What ways do mother's working condition influence maternal health in Abulom kingdom.
4. How does social support influence maternal health in Abuloma kingdom?

METHODOLOGY

This study was a descriptive cross-sectional study. Population for the study comprises of woman of child bearing aged (15-49years) residing in Abuloma kingdom of Port Harcourt local government area of Rivers state. The total population of this study is 3000 through census. Eligible participants for this study include all women that have given birth in the last one year or were pregnant and resident in Abuloma Kingdom of Port Harcourt local government area. Every eligible woman in Abuloma kingdom had equal chance of being selected for the study. The sample size for this study was 360. multi-stage random sampling technique was employed to select 360 respondents to be studied. A standardized questions titled, Socio-cultural factors influencing maternal Health in Abuloma Kingdom of Port Harcourt Local Government Area of Rivers state was used as the instrument for the study. A total of 360 copies of the questionnaire were administered to the respondents, while 346copies were retrieved and used for the analysis. The data gathered were collated, coded and analyzed using frequency and percentages.

RESULTS

Table 4.7: The Social Factors that Affect Maternal Health of Respondent

S/N	Items	Yes		No	
		N	%	N	%
1.	Have you had any form of violence?	220	61.1	140	38.8
2.	If yes, is it from your husband	120	33.3	240	66.6
3.	If no, is it from your in-laws?	139	38.6	221	61.3
4.	Do you believe that a man is justified if he abuses his wife?	216	60	144	40
5.	If a woman goes out without telling her husband, does it warrant the husband to batter her	220	61.1	140	38.8
6.	Should a man beat up his wife because she could not prepare his meal	230	63.8	130	36.1
7.	If yes should the wife complain to her in-laws	167	46.3	193	53.6
8.	Should a man publicly assault his wife?	---	--	360	100
9.	Should a man molest his wife because she could not give him the desired sex of children?	---	----	360	100
10.	If no, should the wife defend herself	360	100	----	---

(61.1%) 220 of the respondents had experience some form of violence, 120(33.3%) said it was from their husbands while (38.6%) 139 said it was from their in-laws. 216 (60%) of the respondents believes that a man is justified if he abuses his wife, 220 (61.1%) said a man should batter his wife if she goes out without telling him, 230 (63.8%) said a man should beat-up his wife if she could not prepare his meal, 167 (46.3%) said they had complained to their in-laws. (100%) disagreed that a man should publicly assault his wife and molest his wife because she could not give him the desired sex of children and all the respondents 360 (100%) agreed that a wife should defend herself if her husband molest her because she could not give him the desired sex of children.

Cultural Beliefs Influencing Maternal Health of Respondent

S/N	Items	Yes		No	
		N	%	N	%
1.	Do your people practice female circumcision?	16	4.4	344	95.5
2.	Do you think female circumcision is bad?	327	90.8	33	9.1
3.	Do your people practice early marriage?	253	70.2	107	29.7
4.	Do your people value male children to female children?	236	65.5	124	34.4
5.	Should the wife be denied of her financial benefits because she could not have a male child?	219	60.8	141	39.1
6.	Do your people value giving birth at the TBA's home? to clinic or hospital?	231	64.1	129	35.8
7.	Drinking Alcohol during pregnancy is good ?	235	65.2	125	34.7
8.	Do your people practice food taboos during pregnancy?	220	61.1	140	38.8
9.	Should children be prevented from eating egg?	112	31.1	248	68.8
10.	Do you believe that culture can influence health behavior?	223	61.9	137	38.0
11.	Does poverty leads to early marriage?	243	67.5	117	32.5
12.	Do you believe that women of childbearing age Need medical attention?	245	68.0	115	31.9
13.	Do you believe that relying on home remedies to solve Problems are better than relying on health professionals?	297	82.5	63	17.5
14.	Does the death of the women's husband gives in the right to refuse her from her inheritance?	88	24.4	272	75.5

From the table above (70.2%) 253 of the respondents practice early marriage and (67.5%) 243 believes that poverty can lead to early marriage. The prevalence of male children to female children is 236(65.5%) and that of 235(65.2%) reported that drinking alcohol during pregnancy is good for a pregnant woman. 220(61.1%) of the respondents practice food taboos during pregnancy and 208 (57.7) said it is snail while 112 (31.1%) said it is egg and 223(61.9%) of the respondents all believed that culture can influence health behavior.

Working Conditions Influencing Maternal Health of the Respondents

SN	Items	Yes		No	
		N	%	N	%
1,	Are you a housewife?	129	35.8	231	64.1
2.	Are you an employee?	218	60.5	142	39.4
3.	Are you a business woman?	200	55.5	160	44.5
4.	Are you a Tailor?	29	8.0	331	91.9
5.	Are you a Teacher?	261	72.5	99	27.5
6.	Do you leave your home to work before? 6am in the morning?	27	7.5	333	92.5
7.	Do you leave your home to work after? 6am in the morning?	333	92.5	27	7.5
8.	Is your house very distance to your work place?	247	68.6	113	31.3
9.	Do you close from your work as early as 4pm?	141	39.1	219	60.8
10.	Do you have a good relationship with your boss?	227	63.0	133	36.9

129(35.8%) of the respondents reported they are Housewife, 218(60.5%) are Employees, 200 (55.5) are Business women, 29 (8.0%) are Tailors, 261(72.5%) are Teachers. 27 (7.5%) of the respondents leave their home to work before 6am in the morning and 247 (68.6%) agreed that their house is very distance to their work place and 141(39.1%) close from work as early as 4pm. 227(63.0%) have a good relationship with their boss.

Social Support Influencing Maternal Health of Respondents

SN	Items	Yes		No	
		N	%	N	%
1.	Do you usually get help/ support from your partners?	261	72.5	99	27.5
2.	Do you usually get help/ support from in-laws?	110	30.5	250	69.4
3.	Do you depend majorly for advice from your Professionals?	200	55.5	160	44.4
4.	Do you always remember to go for counseling?	45	12.5	315	87.5
5.	Is the source of help/ advice from your professionals Effective?	213	59.1	147	40.8

261 (72.5%) of the respondents reported that they get help/ support from their partners while 110 (30.5%) said that they get help/ support from their in-laws. Majorly 200(55.5%) agreed that they depend majorly on advice from professionals, 45 (12.5%) always remember to go for counseling and 213 (59.1%) said their source of advice are from professionals.

DISCUSSION OF FINDINGS

Social factors that has effect on Maternal Health

The finding of this study shows that violence towards women is high (61.1%). This is in agreement with the studied carried out by WHO (2010) who reports that 15% to 71% of women around the world have suffered physical or sexual violence committed by an intimate male partner at some point in their lives. Atama (2011) reported that the most serious crimes against women are actually on a faster rate. In this study, the result obtained was (80%) out of the three hundred and sixty (360) correspondent that participated in the study. (33.3%) of the women said that they had experienced some form of violence from their husbands while (38.6%) of them said that Violence towards them was from their in-laws. (60%) believed that a man is justified if he abuses his wife, (100%) disagreed that a man has no right to publicly assault his wife and has no right to molest his wife because she could not give him the desired sex of children having known that the women don't have the XY chromosomes that determine the sex of children. WHO (2010) reports that violence has serious health consequences for women generally. About 70% of women has been abused or molested which has resulted to injuries, unwanted pregnancy, sexually transmitted infections, depression and chronic diseases. Since 1980, Rape rates have risen nearly 4 times as fast as the total crime rate.

Cultural Beliefs that is Associated with Maternal Health.

The findings of the second research questions dealt with the cultural beliefs that influence Maternal Health. The result in this study shows that (70.290%) of the respondents practice early marriage, (65.5%) practice child sex preference and (60.8%) agreed that a woman should be denied of her financial benefits if she could not have a male child. This is in line with the study carried out by World Health Organization (2007) opined that in a number of traditional communities 80% of the girls are engaged in marriage at their very early ages of life (11 – 13) and they are usually exposed to the pressure of having male children not only to belong the husband's lineage but also to secure access to inheritance. Drinking alcohol during pregnancy was a common practice in this study (65.2%) and this report is in disagreement with Noah (2010) who reports that drinking during pregnancy is bad and it has been proven not safe because about 50,000 babies are born with some degree of alcohol – related damages and birth defects. It was also discovered that (61.1%) of the respondents practiced food taboos. Nearly half of the participants did not know the effects of iron-rich food on preventing anemia and such cultural practices can expose women/girls to the health risks of lack of nutritional supplements that can lead to high maternal morbidity and mortality. Momoh et al (2010).

Working Conditions on Maternal Health.

The finding indicates that, working conditions has influence on maternal health. This findings support Gallie (2003) who reported that the nature of work tasks and work organization is crucial both to personal well-being and to social cohesion. Countless women lack access to decent work that would enable them to rise above poverty and work in safe conditions. (60.5%) all agreed to be employees, (72.5%) are teachers (55.5%) are business women and (35.8%) are housewives. Majority of the participants explained that although they work extremely hard alongside with their husbands, they reported that the majority of the income belonged to the husband and they do not receive cash other than what is meant for daily expenses, and because of this limited income they must go out and work hard to obtain personal funds, including those for medical expenses and sometimes comes back home very late due to the kind of work they do (ILO, 2010). This is in agreement with this study because most of the respondents (60.8%) disagreed that they close from work early as 4pm.

However, in sub Saharan African and south Asia where the highest rates of maternal mortality are reported, more than 80 percent of the women workers are considered to be working in precarious and vulnerable conditions, mainly either in the informal economy, lacking maternity protection at work or certain industries. (68.6%) agreed that their house is very distance to their work place. This findings is in agreement with kowaleswki, el al(2004) which says Opportunity cost and financial problems related to the situation for being far from home for (extra money, for shelter, food and clothes) are the main causes of maternal health. Azim el al (2011) also agreed in their study that 50% of these women over work themselves in order to support their family due to the family economic status, and this invariably has adverse effect on their health

The Social Support and Its Influence on Maternal Health.

The fourth research questionnaire identifies the social support and its influence on maternal health among women of child bearing age in Abuloma Kingdom. This study reveals that (72.5%) of the respondents get help/support from their partners while (30.5%) get help/support from their in-laws and this reveals that individuals who have a great deal of social support. This is in line with the findings of strobes (2008) who said that about 50% of the women who believed and agreed that supporting others is good and available had really helped and affected their coping process positively.

He also said the health impact of stressful events but not only depend on the nature of these events but also on the individual's ability to cope with crisis and on the extent to which they receive social support from relatives, friends and other members of their social network. (55.5%) of the participants reported that they depend majorly for advice from their professionals. Kitts and Roberts, (2013) reported that the participants (50%) limited choice for seeking care is one of the reason for their heavy reliance on professional health care workers who are considered to be more secretive and friendly each woman comes to terms with the changes in own way, with the support of her partner, family or health professionals. Abdull (2013) also noted that family support networks are generally weaker in cities than in villages, leaving many women without the support of the extended families and in-laws in order to obtain adequate antenatal and obstetric care. Kitts el al, (2011) said that social support from others, such as friends, neighbors, relatives, husbands and in-laws can play an important role in fastening the physical and psychological health of women and can greatly influence the health seeking behavior of women.

Recommendations

The following recommendation where considered appropriate:

1. There should be a re-enforced extension of maternal health care services to the rural areas through health programs.
2. Policy effort should identify pointers of cultural and social conditions that generate and express basic needs and unmet needs related to the quality of maternal health in the community.
3. There should be targeted health policies towards maternal well-being during pregnancy in the working place. Policies establishing flexible working hour for pregnant women, such as closing earlier than others to avoid the pressure on the road and to be able to attend to home activities also for them to have enough time to prepare and rest for the next day activities can be established. This is to enhance protective factors, as well as buffering and moderating risk factors identified in this study.
4. Government should keep every effort in place to reduce effect of poverty. Improving living conditions in such areas as good road network, provision of other infrastructure, income, housing, transportation, education, social support and health services, will greatly impact on the well-being of pregnant women, thereby reducing the level of stress in raising the

- family economic status.
5. Women double roles appear to have negative influence on maternal health. Given the scarcity of resources which lead to women's involvement in economic activities, increased attention should be given to the strengthening of natural social support system to assist women during pregnancy.
 6. Addressing many commonly held attitudes and behaviors, like gender roles, and other cultural beliefs that are inimical to health are cultural issues, which can be achieved through community based programmes, health promotion and health education.
 7. Finally, there must be strong political will on the part of government at all levels that will help in reducing maternal mortality in Nigeria.

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Attitude towards Cervical Cancer Screening Among Antenatal Women Visiting Primary Health Care Centres in Rivers State

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Abstract

Attitude towards cervical cancer screening is essential determinant for its acceptance and practice among women. This research examined the attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State. The descriptive survey research design was adopted for the study. The population for the study consists of all the five hundred and fifty-five thousand, six hundred and fifty-one (555,651) women attending antenatal clinics in Rivers State. Sample size of 798 was determined using Taro Yamane formula. A multi-stage sampling procedure was used to select the sample. The instrument for data collection was a structured questionnaire with a reliability coefficient of 0.78. The completed copies of the questionnaire were retrieved, coded and analyzed using Statistical Package for Social Sciences (SPSS) version 23.0. The descriptive statistics of percentage, frequency count and mean was used for demographic characteristics of the participants and research questions. While inferential statistics of chi-square set at 0.05 alpha level was used to test the hypotheses. The finding of the study showed that majority of the respondents had positive attitude towards cervical cancer. The result shows that there was no significant relationship between socio-demographic factors such as age ($p>0.05$), education ($p>0.05$), religion ($p>0.05$) and attitude towards cervical cancer screening. It was concluded that the antenatal women visiting primary health care centres in Rivers State has positive attitude towards cervical cancer screening. It was recommended that, the Ministry of Health should make effort to promote cervical cancer screening among women by establishing well-organized cervical cancer screening programme primary health care services.

Keywords: knowledge, cervical cancer screening, primary health care centre, ante-natal women

Introduction

Attitude towards cervical cancer screening is an essential determinant for its acceptance and practice among women. Globally, cervical cancer is the third most frequent cancer among women and the most common malignancy of the female genital tract in the developing countries (International Cancer Organization, 2016). In sub-Saharan Africa, 34.8 new cases of cervical cancer are diagnosed per 100,000 women annually and 22.5 per 100,000 women die from the disease. According to the Cervical Cancer Global Crisis Card, Nigeria ranks 5th among countries with regards to death count from cervical cancer (Cervical Cancer Free Coalition, 2017). The high burden of cervical cancer in developing countries, like Nigeria, is due both to a high prevalence of HPV infection and the lack of effective cervical cancer screening programmes (Ndikom & Ofi,

2012). In cases where effective screening programmes are available, negative health-seeking behaviour of the populace and poor knowledge have led to poor utilization of such services. Moreso, several reasons have been implicated for the poor cervical cancer screening practice among women.

The two major histologic types of cervical cancer include cervical carcinoma and adenocarcinoma. This may in the later stage cause difficulties but at the initial stage may cause symptoms; this makes early screening very vital owing to the asymptomatic nature of the disease. The World Health Organization (2013) recommended cervical cancer screening tests for precancerous lesions and women at risk, because most of the cancers have no symptoms. This screening includes the conventional Papanicolau (Pap) test, liquid based cytology, visual inspection with acetic acid or lugols iodine (VIA or VILI) and Human papilloma virus (HPV) testing for high risk HPV types.

Age is one major epidemiological variable which influences several health issues including cervical cancer screening, that is, age at first intercourse and age at first pregnancy. Figures from the Ibadan Population Based Cancer Registry (IBCR) covering a two year period 2009-2010 show that cervical cancer age standardized mortality rate (ASR) was 36.0 per 100,000 (Elima et al., 2012) which is higher than in most developed countries. The American Cancer Society (2017) stated that, women who were younger than 17 years when they had their first full-term pregnancy are almost two times more likely to get cervical cancer later in life than women who waited to get pregnant until they were 25 years or older. Also, women younger than 20 years old rarely develop cervical cancer. The risk goes up between the late teens and mid-30s. Women past this age group remain at risk and need to have regular cervical cancer screenings.

Parity is the number of live-born children a woman has delivered. According to Ifemelumma et al. (2019), parity is associated with increased chances of being screened for cervical cancer among women. This may be because as the women increase in the number of children born, they are more likely to approach health care facility for antenatal care and different types of reproductive morbidities when opportunistic screening is also done. On the other hand, nulliparous women may scarcely visit a health facility for reproductive morbidities, some resort to quacks even when they are at risk hence, depriving themselves of opportunities to receive professional advice from healthcare workers as regards their reproductive health issues.

Religion is a system of belief and practice by which individuals indicate their recognition of the existence of a god or gods. Religious affiliation could influence the choices of health practices among women. Religion has a strong force in determining several health behaviours in a large context across the globe. Some women may have low knowledge, negative attitude and poor practices towards cervical cancer because of their religious affiliation as they may not believe that they can have such illness as cervical cancer hence, needless screening for it. Some may even associate practicing cervical cancer screening as faithlessness in their God and doubting His ability to keep such illness far from them. Thus, the religion of women may have a strong influence on cervical cancer screening among them.

Education influence several aspects of life and health including cervical cancer screening. Education exposes an individual to several information and awareness about vast life issues which facilitates informed decision about health issues. However, strategic communication targeting eligible women and universal cervical cancer screening facilities for antenatal women which could increase the uptake of the screening are not available. This had influenced the attitude of women towards the screening. Therefore, this study will assess the attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State.

Challenges of cervical cancer screening in developing countries include limited access to health services and laboratories, no screening programs, limited or nonexistent awareness among

populations and health workers, and poor referral and follow up. Several women die in Rivers State due to cervical cancer. This in most cases was not as a result of the disease but due to late diagnosis of the disease. Most cancers including cervical cancer do not exhibit serious symptoms to give signal that it is developing, this makes many women affected with cervical cancer not to know their status until the disease grow to its late stage and become so threatening to life before they decide to visit a doctor. At this stage, it becomes difficult for them to manage it cum the high cost of treatment involved which many could not afford thereby leading to death. This is so saddening and calls for urgent public health attention. Therefore, this study assessed the attitude regarding cervical cancer screening among antenatal women visiting primary health care centres in Rivers State.

Aim and Objectives of the Study

The aim of this study was to assess the knowledge, attitude and practice regarding cervical cancer screening among antenatal women visiting primary health care centres in Rivers State. Specifically, the study seeks to:

1. examine the attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State.
2. establish the influence of socio-demographic factors (age, education and religion) on the attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State.

Research questions

This study provided answers to the following research questions:

1. What is the attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State?
2. What is the relationship between socio-demographic factors (age, education and religion) and attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State?

Hypothesis

The following null hypothesis postulated was tested at 0.05 alpha level:

Socio-demographic factors (age, education and religion) will have no significant relationship with attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State.

Conceptual Framework

The conceptual framework for this study was discussed under the following sub-headings:

Concept of cancer

Cancer is a large family of diseases that involve abnormal cell growth with the potential to invade or spread to other parts of the body. They form a subset of neoplasms. A neoplasm or tumor is a group of cells that have undergone unregulated growth and will often form a mass or lump, but may be distributed diffusely (Jayasekara et al., 2016). They can also be malignant tumors. Anand et al. (2008) stated that, cancer is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. The most common types of cancer in females are breast cancer and cervical cancer. They can also be malignant tumors.

Concept of Cervical cancer

Cervical cancer usually develops slowly over time. Before cancer appears in the cervix, the cells of

the cervix go through changes known as dysplasia, in which cells that are not normal begin to appear in the cervical tissue. Later, cancer cells start to grow and spread more deeply into the cervix and to surrounding areas. Cervical cancer is a disease in which malignant (cancer) cells form in the cervix. The cervix is the lower, narrow end of the uterus (the hollow, pear-shaped organ where a fetus grows). The cervix leads from the uterus to the vagina (birth canal) (National Cancer Institute, 2019). Bosch (2008) stated that, virtually all cervical carcinomas are caused by persistent infection with Human Papillomavirus (HPV), most commonly HPV types 16 and 18. The two major histologic types of cervical cancer include cervical carcinoma (SCCx) and adenocarcinoma. SCCx is the most common type, representing seventy percent of cases while Adenocarcinoma, which is more commonly associated with HPV type 18, comprises approximately twenty-five percent of cases.

Concept of Cervical Cancer Screening

Screening is the principal preventive measure used to reduce the burden of cervical cancer. Screening is looking for cancer before a person has any symptoms. This can help find cancer at an early stage. When abnormal tissue or cancer is found early, it may be easier to treat. By the time symptoms appear, cancer may have begun to spread. According to the Centers for Disease Control and Prevention (2007), cervical screening is the process of detecting and removing abnormal tissue or cells in the cervix before cervical cancer develops. Denny et al. (2015) stated that, the main purpose of cervical cancer screening is the identification of early-stage invasive cancer. This is achieved through use of the conventional cytology-based Papanicolaou smear (Pap smear) to identify cervical cancer precursors that can be removed before progression to invasive cancer. By aiming to detect and treat cervical neoplasia early on, cervical screening aims at secondary prevention of cervical cancer.

Concept of Attitude

Attitude refers to a set of emotions, beliefs, and behaviours toward a particular object, person, thing, or event. Attitudes are often the result of experience or upbringing, and they can have a powerful influence over behaviour. While attitudes are enduring, they can also change. It can also be seen as learned tendency to evaluate things in a certain way. This can include evaluations of people, issues, objects, or events. Such evaluations are often positive or negative, but they can also be uncertain at times. For example, you might have mixed feelings about a particular person or issue. It is a mental or neural state of readiness organized through experience influencing dynamically or directly the individuals' response to all objects and situations with which it is related.

METHODOLOGY

This study was a descriptive survey research design. The target population for this study comprised all the women attending antenatal clinics in Rivers State. There are about five hundred and fifty-five thousand, six hundred and fifty-one (555,651) women attending antenatal clinics in Rivers State (National Population Commission, 2010; WHO, 2015) which was chosen as the population for the study. The multi-stage sampling procedure was employed to select the sample. First, stratified random sampling technique was used for the existing three geographical zones to get three strata, then secondary simple random sampling technique was used to select two Local Government Areas from each of the stratum to give every LGA equal opportunity of being selected. Thereafter, stratified proportionate sampling technique was used to determine the number of women to be selected from each LGA.

The instrument for data collection was a structured questionnaire titled: "attitude of cervical cancer screening questionnaire (ACCSQ)". The instrument consisted of four sections A and B.

Section A elicited responses on demographic data of respondents; Section B measured the attitude of respondents with response options of true or false. A total of 798 respondents were administered the questionnaires, and introduction letter was attached to the questionnaire, while 761 were retrieved, which represents 95.4% of the total questionnaires distributed immediately after the completion.

Results

Research Question 1: What is the attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State?

Table 2: Attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State

SN	Items	Mean	SD
1	One need not to be aware of cervical cancer because I cannot have it at any exposure.	1.43	.877
2	Cervical cancer is a deadly disease if not screened and treated	3.42	.880
3	One cannot be cured from cervical cancer once a diagnosis is made	1.58	.772
4	Cervical cancer cannot lead one to be infertile if left unscreened	1.43	.681
5	Cervical cancer screening is important because all females are at risk of having cervical cancer	2.66	.483
6	One derives great benefit by going to the clinic for regular medical check-up	3.55	.546
7	One can have cervical cancer through unsafe sexual practice, so screening must be done by sexually active women	3.53	.621
8	It is good to screen for cervical cancer even without having symptoms of the cancer	3.50	.739
9	Women should have Pap smears from the onset of their sexual activity	3.50	.622
10	Women should go for screening only when they notice some symptoms in the cervix	1.56	.630
11	Women should discontinue cervical cancer screening after menopause	3.45	.673
12	cervical cancer screening procedures are unpleasant	1.72	.915
13	I would like to have the screening done if I were told it is simple, painless and good for early detection	3.36	.861
14	I will go the screening if it is offered free of cost	3.28	.919
15	I will feel embarrassed if a male doctor performs the test for me	1.54	.885
	Grand mean	2.63	.74

Table 2 shows the attitude of towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State. The result shows that the grand mean = 2.63 was greater than the criterion mean = 2.5 indicating that the respondents had positive attitude towards cervical cancer screening.

Research Question 2: What is the relationship between socio-demographic factors (age, education and religion) and attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State?

Table 3: Relationship between socio-demographic factors (age, education and religion) and attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State.

Socio-demographic factors	Attitude towards C/cancer		Total F(%)	r-value	Decision
	Positive F(%)	Negative F(%)			
Age				.071	*VLR
20-29 years	153(67.4)	74(32.6)	227(100)		
30-39 years	257(61.9)	158(38.1)	415(100)		
40-49 years	68(57.1)	51(42.9)	119(100)		
Total	478(62.8)	283(37.2)	761(100)		
Education				.054	*VLR
None	59(68.6)	27(31.4)	86(100)		
Primary	104(68.0)	49(32.0)	153(100)		
Secondary	231(59.4)	158(40.6)	389(100)		
Tertiary	84(63.2)	49(36.8)	133(100)		
Total	478(62.8)	283(37.2)	761(100)		
Religion				.029	*VLR
Christianity	442(63.2)	257(36.8)	699(100)		
Islam	36(58.1)	26(41.9)	62(100)		
Total	478(62.8)	283(37.2)	761(100)		

Table 3 shows the relationship between socio-demographic factors (age, education and religion) and attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State. The result shows that there was a very low relationship between age (r-value = .071), education (r-value = .054), religion (r-value = .029) and attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State.

Testing of Hypotheses

Hypothesis 1: Socio-demographic factors (age, education and religion) will have no significant relationship with attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State.

Table 4: Chi-square test showing the relationship between Socio-demographic factors (age, education and religion) and attitude towards cervical cancer screening among antenatal women visiting primary health care centres.

Sociodemographic factors	Attitude towards C/Cancer Positive F(%)	Negative F(%)	Total F(%)	df	X ² value	pvalue	Decision
Age				2	3.823	.148	Accepted
20-29 years	153(67.4)	74(32.6)	227(100)				
30-39 years	257(61.9)	158(38.1)	415(100)				
40-49 years	68(57.1)	51(42.9)	119(100)				
Total	478(62.8)	283(37.2)	761(100)				
Education				3	4.946	.176	Accepted
None	59(68.6)	27(31.4)	86(100)				
Primary	104(68.0)	49(32.0)	153(100)				
Secondary	231(59.4)	158(40.6)	389(100)				
Tertiary	84(63.2)	49(36.8)	133(100)				
Total	478(62.8)	283(37.2)	761(100)				
Religion				1	.651	.420	Accepted
Christianity	442(63.2)	257(36.8)	699(100)				
Islam	36(58.1)	26(41.9)	62(100)				
Total	478(62.8)	283(37.2)	761(100)				

Table 4 shows the chi-square test of significant relationship between socio-demographic factors (age, education and religion) and attitude towards cervical cancer screening among antenatal women visiting primary health care centres. The result shows that there was no significant relationship between socio-demographic factors (age (X^2 -value = 3.823, df = 2, $p > 0.05$), education (X^2 -value = 4.946, df = 3, $p > 0.05$) and religion (X^2 -value = .651, df = 1, $p > 0.05$) and attitude towards cervical cancer screening. Therefore, the null hypothesis which states that there was no significant relationship between socio-demographic factors (age, education and religion) and attitude towards cervical cancer screening among antenatal women visiting primary health care centres in Rivers State was accepted.

Summary of Major Findings

1. The result in Table 2 shows that antenatal women had positive attitude towards cervical cancer screening.
2. The result shows that there was no significant relationship between socio-demographic factors (age (X^2 -value = 3.823, df = 2, $p > 0.05$), education (X^2 -value = 4.946, df = 3, $p > 0.05$) and religion (X^2 -value = .651, df = 1, $p > 0.05$) and attitude towards cervical cancer screening.

Discussion of Findings

Attitude towards cervical cancer screening

The result in Table 3 shows that antenatal women had positive attitude towards cervical cancer screening as the grand mean = 2.63 was greater than the criterion mean = 2.5 indicating that the respondents had positive attitude towards cervical cancer screening. This finding is encouraging because attitude has been identified as one major determinant of health practice, on the other hand negative attitude can be implicated for late presentation of cervical cancer. Data shows that several women die due to cervical cancer. This in most cases was not as a result of the disease but due to negative attitude which was expressed in the late presentation of patients for diagnosis of the

disease. Most cancers including cervical cancer do not exhibit serious symptoms to give signal that it is developing, this makes many women affected with cervical cancer not to know their status until the disease grow to its late stage and become so threatening to life before they decide to visit a doctor. The finding of this study corroborates that of Bansal et al. (2015) which showed that majority, 80.5% expressed a positive attitude toward cervical cancer and screening. About three-fourth (76.2%) women were willing to be screened if offered free of cost. The finding of this study gives credence to that of Aweke et al. (2017) which showed that more of the respondents had positive attitude toward cervical cancer screening. The finding of this study is in line with that of Olubodun et al. (2019) which showed a positive attitude expressed by the respondents as majority of them expressed willingness to undergo the screening when asked. Similarity found between the present study and the previous ones might be due to the homogeneity of the study population as they were both carried out among women of childbearing age. However, the findings of this study are different from results found in other studies. The finding of this study is at variance with that of Ahmed et al. (2013) which showed that attitude of respondents towards cervical cancer screening was poor.

Socio-demographic factors and attitude towards cervical cancer screening

The result shows that there was no significant relationship between socio-demographic factors (age (X^2 -value = 3.823, df = 2, $p > 0.05$), education (X^2 -value = 4.946, df = 3, $p > 0.05$) and religion (X^2 -value = .651, df = 1, $p > 0.05$) and attitude towards cervical cancer screening. This finding is unexpected hence, surprising because these socio-demographic facts are known to influence the attitude of individuals particularly education and religion about several aspect of life but the contrary was found in this study. Religion which is expression of one's faith has been found to peoples attitude and decisions about several issues life. The finding of this study is not similar to that of Bansal et al. (2015) who assessed the knowledge, attitude, and practices related to cervical cancer among adult women, the result showed that education level influences attitude towards cervical cancer screening ($p < 0.05$). The dissimilarity between the previous study and the present one might be due to that fact that the previous study combined both the attitude towards cervical cancer and the screening whereas the present study was focused only on cervical cancer screening.

Conclusion

Based on the findings of the study, it was concluded that the antenatal women visiting primary health care centres in Rivers State have positive attitude towards cervical cancer screening.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. The primary health care board should adapt cervical cancer screening package by integrating it with other reproductive health services like antenatal and postnatal care services.
2. There is the need for health educators to establish a sustainable awareness campaign about cervical cancer screening through the media and other channels of communication.
3. The government should provide special centres for cervical cancer screening at strategic positions to encourage its practice.
4. Women also have a role to play by making conscious and voluntary effort to be screened by presenting their self for the screening.

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Influence of Constructive Deviant Behaviour on Waste Management Operation in Port Harcourt, Nigeria

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Abstract

This study investigated the possible influences of constructive deviance on waste management operation in Port Harcourt, Rivers State. The study was a descriptive analysis. Three research hypotheses were formulated to guide the study. The simple random sampling technique was utilized and sample size of thirty (30) was chosen. The Least Square and Multiple Regression Analysis were used for the organization of data. The result indicated that organization effectiveness is not a function of constructive deviance. Also, there was a negative relationship between deviance behaviour targeting waste management agency and organizational performance. Thus, it is recommended that waste management agency should encourage constructive deviance behaviour to enhance and promote organizational performance and efficiency in the waste management operation in Port Harcourt.

Keywords: waste management, constructive deviance, organizational effectiveness.

1.1 Introduction

In modern society, the term “waste” has become an issue to most developing countries due to advancement in science and technology (transportation, communication science, computer, electronics, industries among others.). This has given rise to a more complex waste stream. The ability to effectively manage these wastes(domestic, commercial, electronics, industrial, hospital among others) that are being generated in such a way and manner that it becomes eco-friendly has become a teething challenge in developing countries. However, kafandoet al., 2013 define waste as any residue of a production, processing or use of any substance, material, product or more generally, any personal property abandoned or which the holder intends to abandon. It is “something” which the owner no longer wants at a given time and space and which has no current or perceived market value (Ogbonna et al., 2002).

According to Centre for Environment and Development (2003),the classification of waste depends on the followings: origin (food waste, rubbish, ashes, residues, demolition and construction, agriculture, e-wastes). Here, the source plays a significant factor e.g., industrial, domestic, commercial, medical sources; Characteristics (biodegradable and non-biodegradable wastes). The biodegradable consists of putrescible substances that are eco-friendly while the non-biodegradable wastes are not eco-friendly; and Potential risks (hazardous waste: toxic, chemically reactive, flammable, corrosive). Therefore, proper and careful handling of these wastes should be carried out at all times in a bid to reduce its associated risks. Waste could be typified in solid, liquid, or gaseous form(Bibiye, 2020).Consequently, waste management is the process of collection,

sorting and separation or segregation, storage, administration, and financing including monitoring and regulation according to the United Nation Statistics Division (2017). It involves collection, transportation, recovery, disposal of waste, supervision of such operations, and the aftercare of disposal site including the actions taken as a dealer or broker (Nasir, 2017). Thus, an effective, efficient management strategy, skills, style, and technicalities are needed to bring to bear, sound waste management operation in a bid to achieving the most expected positive result in an organizational setting. One of such management templates that could enhance effective waste management is the absorption of constructive deviance.

The term “deviant” simply refers to any individual who fails to obey or conform to a social norm. Deviance connotes negative, and thus, expressed as violating the norms which can be considered as harmful to society or organization. However, on the contrary, constructive deviant is typified as innovative i.e., a beneficial act of an innovative or creative nature that is directed to the organization (Galperin, 2002). It is a set of any voluntary and intentional behaviours that is targeting the well-being of the organization, breaking significant organizational norms and rules, and forming hypernorms (i.e., an essential moral rule for all humans) (Vedera et al., 2013; Yildiz et al., 2015). Hypernorms are those norms which are concretized in the respective social and cultural context and become manifested in the community according to Urdu (2017). Moreso, hypernorms are not exclusive because they consider that there can be a difference in the cultural specification. Nonetheless, not every ethical norm can be traced back to a hyper norm and not all existing differences in the system of ethical norms are caused by a different cultural, religious, or philosophical imprint (Dunfee, 2006). Deviance can be regarded as an encouraging basis of creativity; an innovation rather than simply harmful behaviour as creative and ground-breaking process frequently require individuals to deviate from existing norms and the *status quo*. Focusing on positive side of deviant behaviour, scholars have labeled the act of disregarding significant norms of the reference group to achieve socially desirable ends as positive deviance (Kim & Choi, 2018).

Contemporary, management science literature upholds that constructive stream of deviance is recognized as a positive conduct in the organization and it takes into cognizance whistle blowing, organizational dissent and functional disobedient (purposeful disobedient) (Ridic & Aidoo, 2016). The authors also identified destructive stream of deviance i.e., negative conduct and attitude in an organization to include alcohol, corruption, and theft. However, Interpersonal constructive deviance is directed at individuals and exercise such behaviour like disobeying managerial orders in a bid to improve organizational processes while organizational constructive deviance is targeted at the organization and include two basic ideologies: **a.** innovative behaviours aimed at helping the organization (i.e., finding creative ways to resolve problems) **b.** behaviours that changes existing norms to help the organization (i.e., breaking rules in order to solve client problems) (Bodankin & Tziner, 2009; Robbin & Galperin, 2010).

Furthermore, there is a great distinction between constructive or positive (workplace) deviance and dysfunctional (workplace) deviance. The latter is a voluntary behaviour that violates organizational norms and thus threatens the organizational well-being, its members or both while the former is seen as a behaviour that violates organizational norms with the intent of helping the organization (Robbins & Galperin (2015); Alida, n.d; Galperin, 2003; Warren, 2003; Spreiter & Sonenshein, 2004; Ergun et al., 2004; Morrison, 2006; Warren, 2013). The fact that these behaviours are impermissible by the managerial levels, they assist the organization in achieving its objectives (Bodankin & Tziner, 2009). For example, in 2014, the Sole Administrator of RIWAMA employed constructive deviance as a way of enforcing waste management laws in Port Harcourt overnight (mostly those nocturnal activities that precipitate volume of wastes along some major streets within Port Harcourt and its environs). Though, citizens cried initially (mostly those whose properties

were either allegedly damaged or impounded) but without being told, the citizens complied. The target of RIWAMA was achieved as waste violators became more conscious and cautious in their act. Worthy of note is the fact that the Public Health Law Cap 106 empowers the Environmental Health Officer(s) to enter into any premises within 6.00am-6.00pm for the purposes of carrying out inspection as the norm but this the sole administrator forgoes and took a more drastic action which was outside the operational norm of the organization to achieve the organization goal under the guise of "constructive deviance".

Constructive deviance entails such behaviours to include taking charge, creative performance, whistle blowing, pro-social behaviour, issue selling among others (Vedera et al., 2013). These are some of the management tools adopted to create and strengthen the performance model of most organizations *vis-a-vis* waste management agencies. Consequently, such drive for decision making and enthronement of such paraphernalia is no longer observed currently in the mainstream of waste management in Rivers State. Some analysts may say that it is an administrative omen for the current government in RIWAMA. However, the question remains: how has this enhanced the organizational effectiveness? 2. Is there any correlation between constructive deviance and organizational effectiveness? 3. If there is, to what extent?

Aim and Objectives

This study aimed at investigating the possible influence of constructive deviance in the waste management operation in Port Harcourt, Rivers State. The specific objectives were:

1. To find out the relationship between organizational effectiveness and constructive deviance in waste management.
2. To find out deviance behaviour targeting waste management agencies (waste management contractors, waste handlers, agencies, etc) and its correlation with organizational performance, and
3. To determine whether interpersonal deviance behaviour influences organizational effectiveness.

Hypotheses

Three research hypotheses were formulated vis:

H0₁: Waste management effectiveness is related to constructive deviance.

H0₂: Deviance behaviour targeting waste management agency affects organization performance.

H0₃: Interpersonal deviance behaviour influences organizational effectiveness.

METHODOLOGY

Sample Design

Analytic descriptive study design was utilized. The design was relevant to this study because it provides a picture of the situation as it naturally happened (Nwankwo, 2016).

Study Area

Port Harcourt is an ancient, largest, and the capital city of Rivers State. It was named after the first viscount of Great Britain -Lewis Vernon Harcourt. The city is situated along the fishing settlement of Okrika (Ijaw tribe) and the farmland of Diobu (Ikwerre tribe), originally. Port Harcourt has a geographical coordinate of latitude and longitude: 4.824167 and 7.03361, with Degree Minute and Second (DMS) (Lat. 4049/27.0012//N and Long. 702/0.9996//E, respectively), and lies 9 meter above sea level, having a tropical climate that exhibits a significant rainfall pattern in most months of the year. It also has short dry season with little effect but longer rainy season with more effect on

man, material, plants etc. It has an area metropolis of 142 sq. mi; land mass of 140 sq. mi and water 3 sq. mi respectively. Port Harcourt has an urban population density of 1,865,000 and an effective transport system(NPC, 2006; UAD, 2015; Williams, 2008; Njoku, 2008). The average annual temperature is 226.4 °C or 79.5°F. More so, precipitation is about 2708 mm or 106.6 inch per year. The most precipitation occur in September with an average of 141 mm or 16.3 inch. The driest month is January with 36 mm or 1.4inch rainfall. Furthermore, the warmest month of the year occur in February, with an average temperature of 26.70 C or 81.7°F while the month of August serves as the coldest month, with an average temperature of 25.2°C or 77.4°F. Temperature varies by 2.4 °C or 36.3 °F throughout the year. The variance in precipitation between the driest month and the wettest month is 378 mm or 15 inches (en.climate-data.org). There are several educational institutions, commercial centers, government, and private companies, including the multi-national companies especially the oil-based companies which has promoted the daily massing of people into the city and by implication the daily increase of municipal solid wastes generation within and around Port Harcourt.



Fig. 3.1. Map of Rivers State showing Port Harcourt and Obio/Akpor Local Government Area.
Source: Google Scholar, 2020

Sample Size and Sampling Technique

A simple random sampling technique was adopted to select six (6) communities (Port Harcourt Township/Borikiri, Trans Amadi, Diobu: Mile 1-3, Abuloma/Ogujagu and Rumueme) in Port Harcourt which share homogenous waste stream and thus, five copies of the questionnaire were distributed to each of the community which sum up a representative sample size of thirty (30). The very low sample size is due to homogeneity compliance of the COVID-19 pandemic protocol.

Result

Table 1: Presentation of Respondents by Organizational Constructive Deviance

S/N	Items	Responses	
		Yes	No
1.	RIWAMA always serves intimation notices on monthly environmental sanitation days via electronic and social media.	25(24.27%)	5(4.67%)
2.	RIWAMA engages enough volunteers during the monthly environmental sanitation activities as compared to the previous administrations.	10(9.71%)	20(18.67%)
3.	There are always enough security personnel to assist, monitor and regulate enforcement during the monthly environmental exercises.	12(11.65%)	18(16.82%)
4.	RIWAMA undertakes extra mile to prosecute all defaulters during the monthly environmental exercises.	13(12.62%)	17(15.89%)
5.	The Environmental Sanitation Mobile Court (ESMC) is 24 hours in operation in Port Harcourt and Obio/Akp or local Government Areas to enforce environmental health laws.	8(7.77%)	22(20.56%)
6.	RIWAMA always purchase waste transportation vehicles to supplement waste management activities in Port Harcourt.	24(23.30%)	6(5.61%)
7.	RIWAMA always provides dumpsters to ease waste collection exercises in Port Harcourt and its environs.	11(10.68%)	19(17.76%)

Source: Field survey, 2020

In Table 1, 25 (24.27%) represents RIWAMA always serve intimation notices on monthly environmental sanitation days (MESDs) via electronic and social media while 5(4.67%) say they do not serve intimation notices on MESDs. Again, 10(9.71%) of the responses represent RIWAMA engages enough volunteers during the monthly environmental sanitation activities as compared to the previous administrations while 20(18.67%) says they do not engage enough volunteers as compared to the previous administrations. 12(11.65%) maintained that there are always enough security personnel to assist, monitor and regulate enforcement during the monthly environmental sanitation exercise while 18(16.82%) maintained that there are not enough security personnel, to assist, monitor and regulate enforcement during the MESDs. Furthermore, 13(12.62%) maintained that RIWAMA undertakes extra mile to prosecute all defaulters during the MESDs whereas 17(15.89%) of the responses do not agree to this statement. Also, 8(7.77%) maintained that the ESMC is 24hrs in operation in Port Harcourt and Obio/Akpor LGAs to enforce environmental health laws and 22(20.56%) do not agree to the is statement. 24(23.30%) of the responses agreed that RIWAMA always purchases waste transportation vehicles to supplement waste management activities in Port Harcourt while 6(5.61%) says RIWAMA do not always purchase waste transportation vehicles. Finally, 11(10.68%) of the responses asserted that RIWAMA always provides dumpsters to ease waste collection in Port Harcourt and its environs whereas 19(17.76%) of the responses says RIWAMA does not always provide dumpsters to ease waste collection activities in Port Harcourt and its environs.

Table 1.1: Computation of Raw Data for the Least Square Regression Analysis (LSRA)

X	25	10	12	13	8	24	11
Y	5	20	18	17	22	6	19

From computation, $\sum X = 103$, $\sum Y = 107$, $\sum XY = 1291$ and $\sum X^2 = 1799$

$$a. = \frac{\sum Y \sum X^2 - \sum X \sum XY}{n \sum X^2 - (\sum X)^2} = \frac{107 \cdot 1799 - 10 \cdot 1291}{10 \cdot 1799 - (103)^2} = \frac{19293 - 13297}{12593 - 10609} = \frac{5996}{1984} = 30$$

$$b. = \frac{n \sum XY - \sum X \sum Y}{n \sum X^2 - (\sum X)^2} = \frac{7 \cdot 1291 - 103 \cdot 107}{7 \cdot 1799 - (103)^2} = \frac{9037 - 11021}{12593 - 10609} = \frac{-1984}{1984} = -1$$

Therefore, $Y = 30 - X$

Table 2: Presentation of Respondent of Deviance Behaviour(s) targeting the organization

S/N	Items	Responses		
		Yes	No	ND
1.	Have you ever come late to work due to poor remuneration or without permission?	15(44.12%)	10(16.23%)	5(14.70%)
2.	Have you falsified any receipt to get reimbursed for more money than you spent on any mission or activity?	5(14.17%)	12(23.07%)	13(38.24%)
3.	Have you ever spent much time fantasizing or daydreaming instead of working?	7(20.59%)	15(28.55%)	8(23.58%)
4.	Have you ever taken any office property without due approval or permission?	7(20.59%)	15(28.55%)	8(23.58%)

Source: Field survey, 2020; ND: Not decided.

Table 2 shows deviance behaviour targeting the organization. The responses revealed that 15(44.12%) comes to work due to poor remuneration, 10(16.23%) does not agree to this statement while 5(14.70%) were undecided on this issue. Also, 5(14.17%) falsified receipt to get reimbursed for money spent on any activity while 12(23.07%) says they do not falsify receipt to be reimbursed and 13(38.24%) could not also make a definite decision. Again 7(20.59%) maintained that they spent much time fantasizing instead of working, 15(28.55%) says they do fantasize while on duty and 8 (23.58%) were undecided. Finally, 7(20.59%) agreed to have taken office property without due approval while 15(28.55%) says they have not taken office property without approval and 8 (23.58%) could give a definite state of either taken office property or not. To further analyze the relationship between constructive deviance and organization effectiveness (waste management agency), Table 2.1 and Table 2.2 are utilized.

Table 2.1: Raw Data Computation

Y	15	5	7	7
X ₁	10	12	15	15
X ₂	5	13	8	8

Table 2.2: Computation of Multiple Regression Analysis (CMRA)

Y	X ₁	X ₂	YX ₁	YX ₂	X ₁ X ₂	X ₁ ²	X ₂ ²
15	10	5	150	75	50	100	25
5	12	13	60	65	156	144	169
7	15	8	105	56	120	225	64
7	15	8	105	56	120	225	64

$$\Sigma 34 \quad \Sigma 52 \quad \Sigma 34 \quad \Sigma 420 \quad \Sigma 252 \quad \Sigma 446 \quad \Sigma 694 \quad \Sigma 322$$

$$\Sigma Y = n\beta + \beta_1 \Sigma X_1 + \beta_2 \Sigma X_2 \quad 34 = 4\beta_0 + 42\beta_1 + 34\beta_2 \quad = 34 = 4 \quad 42 \quad 34$$

$$\Sigma YX_1 = \beta_0 \Sigma X_1 + \beta_1 \Sigma X_1^2 + \beta_2 \Sigma X_1 X_2 \quad 420 = 42\beta_0 + 694\beta_1 + 446\beta_2 \quad 420 = 42 \quad 694 \quad 446$$

$$\Sigma YX_2 = \beta_0 \Sigma X_2 + \beta_1 \Sigma X_1 X_2 + \beta_2 \Sigma X_2^2 \quad 252 = 34\beta_0 + 446\beta_1 + 322\beta_2 \quad 252 = 34 \quad 446 \quad 322$$

By the application of **Siros Rule**, we have as follows:

$$\Delta = 1712, \Delta_0 = 297840, \Delta_1 = 0 \text{ and } \Delta_2 = -59872$$

$$\beta_0 = \frac{\Delta_0}{\Delta} = 173.97, \beta_1 = \frac{\Delta_1}{\Delta} = 0 \text{ and } \beta_2 = \frac{\Delta_2}{\Delta} = -34.97$$

$$\text{But } Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 = 173.97 + (0)X_1 + (-34.97)X_2 = 173.97 - 34.97 X_2$$

SUMMARY OF ANOVA

Sources of Variation	Sum of Squares	Degree of Freedom	Mean Square	F-ratio
BSS	355.67	K-1, 3-1 = 2	177.835	4.64
WSS	345.00	K(n-1) = 3(4-1) = 9	38.333	
TSS	700.67			

Table 3: Presentation of Respondent by Interpersonal Deviant Behaviour

S/N	Items	Responses	
		Yes	No
1	Have you made fun at someone at work?	12(12.63%)	18(15.65%)
2	Have you said something hurtful to someone at work?	15(15.79%)	15(13.04%)
3	Have you played a mean prank on someone at work?	20(21.05%)	10(8.70%)
4	Have you publicly embarrassed someone at work?	09(9.47%)	21(18.26%)
5	Have you consumed alcohol while on duty?	19(20.00%)	11(9.57%)
6	Have you neglect your boss instruction intentionally?	12(12.63%)	18(15.65%)
7	Have you discussed confidential information of the organization or office to an unauthorized person?	08(8.42%)	22(19.13%)

Table 3 considered interpersonal deviance behaviours within an organizational setting. The responses from the respondents revealed that 12(12.63%) had make fun at work while 18 (15.65%) had never done so. 15(15.79%) of the respondents asserted that they had said something hurtful to someone at work while 15(13.04%) have never said something hurtful to someone at work. 20(21.05%) played a mean prank on someone at work while 10(8.70%) had never played a mean prank on someone at work. Furthermore, 9(9.47%) have embarrassed someone at work while 21(18.26%) had never embarrassed someone at work. 19(20.00%) agreed to have consumed alcohol while on duty whereas 11(9.57%) had never consumed alcohol while on duty. More so, 12(12.63%) had neglected their boss instruction intentionally while 18(15.65%) had never neglected their boss instruction intentionally, and 8(8.42%) discussed confidential information of their organization with an unauthorized person while 22(19.13%) had never discussed confidential information of their organization with an unauthorized person.

Table 3.2 Computation of raw data for the Test of hypothesis (Ho) three

X	12	15	20	9	19	12	18
Y	18	15	10	21	11	18	22

$\Sigma X = 105$	$\Sigma Y = 105$	$\Sigma X^2 = 1679$	$\Sigma XY = 1471$
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$$\bar{X} = 15, \bar{Y} = 15, \text{ but } a = \bar{Y} - b \bar{X}$$

$$b = \frac{n \Sigma XY - \Sigma X \Sigma Y}{n \Sigma X^2 - (\Sigma X)^2} = \frac{7 \cdot 1471 - 105 \cdot 105}{7 \cdot 1679 - (105)^2} = \frac{10297 - 11025}{11753 - 11025} = \frac{-728}{728} = -1$$

$$a = 15 - (-1)(15) = 15 + 15 = 30$$

$$Y = a + bX = 30 + (-1)X$$

$$Y = 30 - X$$

Discussion of Findings

The Least Square Regression Analysis (LSRA) model was used to discuss the extent of relationship between waste management and constructive deviance. In testing hypothesis (Ho) one, the model revealed that there exists a negative correlation i.e., to say that there is no significant impact of constructive deviance behaviour on effective waste management since $b < 0$. It does imply that, the independent variable (X) has an inverse function on the dependent variable (Y). Thus, RIWAMA may have demonstrated some quantum of constructive deviance inadvertently in their *modus operandi* in Port Harcourt yet, its impact is insignificant to the effectiveness of the organization. Consequently, the pre-determined goals of RIWAMA may not be achievable. The impression of organization effectiveness lies on how effective an organization is in achieving the outcomes (Etzioni, 1964). It is the degree to which predetermined goals are achieved (Rama, 2014). The current study contracts with the works of Rama (2014) and Etzioni, (1964). The nexus for the current outcome could be that RIWAMA lacks the right plan needed to accomplish her aims, lack the ability to pull resources (men and materials) as applicable in twenty first century waste management operation together to implement those plans. To test of hypothesis (Ho) two, the multiple regression analysis (MRA) model was utilized. The coefficient of $X_1 = 0$ depicts that X_1 has no relationship to the model whereas X_2 does with implicit (negative) correlation. A further test using the single factor analysis of variance (ANOVA) revealed slight heterogeneity $\{F_{(4,64)} > F_{4,26}[(K-1), n-1(K-1)]\}$. Thus, the Ho is rejected and the alternate (H_1), i.e., deviance behaviour targeting organization (waste management agency) does not affect organization performance is accepted. Smith (2020) revealed further that organization effectiveness is a degree of several other key determining factors like efficiency of business, employee productivity, how effective an organization meets her objectives, alignment among business functions etc. and not merely constructive deviance as the major

determinant factor for organization performance. Finally, the test of hypotheses(Ho) three was also carried out with the LSRA model. The negative coefficient of X defines an inverse relationship with the dependent variable Y. This simply means and include that the extend of influence of interpersonal deviance behaviour on organization effectiveness (waste management agency) is quite insignificant. According to Pulich and Tourigny (2004) and Fine, Horwitz *et al.*, (2010) interpersonal deviance can occur when misconduct target(s) specific stakeholders such as co-workers' behaviour within the organization falls within gossiping about co-workers, supervisor, subordinates, playing mean pranks, acting rudely, and assigning blame to them. It does means and include that theft, vandalism, physical assault, sabotage, gossip, etc. which are key indicators of interpersonal constructive deviance behaviour(Hollinger & Clark 1982;Lawrence & Robinson, 2007;Ahmed, 2018;Lawrence & Robinson, 2017)does not exist in RIWAMA, and if it does exit, it influences on the agency is less significant. This contrasts the views of Galperin (2012).

Conclusion

The study undertakes regression model to determine whether waste management effectiveness is related to constructive deviance, deviance behaviour targeting waste management agency affect organization performance, and interpersonal deviance behaviour influences organization effectiveness in Port Harcourt, River State. The findings in this research indicate that constructive deviance exert a negative significant effect on the effectiveness of waste management agency, deviance behaviour targeting waste management agency does not affect the performance of the agency, and the interpersonal constructive deviance behaviour does not influence organizational effectiveness. Thus, it is rational to conclude that future research in Port Harcourt should stress more on the influences of deviants' behaviour on the efficiency of waste management agency in Port Harcourt with more scope and larger sample size since the COVID 19 Protocol serve as a major limiting factor to this current work.

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HAND HYGIENE BEHAVIOURAL CHANGE AMID COVID-19 PANDEMIC IN YENAGOA, NIGERIA

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Abstract

It has been widely recognized that adequate hand hygiene behaviour is a simple and cost-effective measure for moderating the spread of covid-19. Hence, this study focused on hand hygiene behavioural change amid the COVID-19 pandemic in Yenagoa. The study adopted the *cross-sectional* survey design, which involved the administration of a set of questionnaires to 400 randomly selected respondents using the multi-stage sampling technique, and physical inspection of household's hygiene facilities. The findings revealed that amid the COVID-19, there was a marginal increase in the status of water supply and hygiene services from the initial levels before the pandemic. The t-test statistic revealed that there was a significant difference in the frequency of hand washing before and amid the COVID-19 pandemic. This means that the level of hand hygiene behaviour among the people increased significantly during the pandemic. However, much still need to be done as a reasonable proportion of the population in Yenagoa do not practice regular hand hygiene due to some identified constraints. It is therefore recommended, that government should provide water and hygiene services for the people and carry out mass education and aggressive campaigns on the need for regular hand hygiene by all.

Keywords: behavioural change, COVID-19 pandemic, hand washing, hygiene, water supply

1.0 INTRODUCTION

Hand hygiene, which is simply the process of hand washing with water and soap has been tested and recognized as an effective barrier to the spread of infectious and contagious diseases (*Dwipayanti et al., 2021; Kanyangarara et al., 2021*). Hence, the WHO has recommended that adequate hand hygiene along with other non-pharmaceutical measures should be deployed as a primary line of action to halt the rapid transmission of the COVID-19 that was declared a pandemic on the 11th of March, 2020 (WHO, 2020).

To promote hand hygiene and achieve its benefits in the fight against infectious diseases, households must have unrestricted access to water and soap at all times. This prompted the WHO and UNICEF in June 2020 to launch the "Hand Hygiene for All" initiative, which was directed at improving hand washing facilities and encouraging positive changes in hand washing behaviour where hygiene facilities are available (WHO & UNICEF, 2021).

Despite global efforts, sub-Saharan Africa and Nigeria in particular still lag and may not meet the WASH goals (SDG 6) by 2030 if the current levels of WASH provision remain the same (UNICEF & WHO, 2019). For instance, globally in 2020, 71% (5.5 billion) people of about 7.7 billion had access to "basic hygiene facilities (availability of a hand washing facility with soap and water at home)"; while 21% (1.6 billion) and 9% (670 million) people had "limited hygiene (availability of a hand washing facility lacking soap and/or water at home)", and "no service (no hand washing facility)", respectively (WHO & UNICEF, 2021). In Nigeria, only 33% (68 million) of the population of about 206 million had basic hygiene facilities; while 36% (74 million) and 30% (62 million) people had limited hygiene and no hygiene services, respectively (WHO & UNICEF, 2021). This shows that Nigeria is among the countries that exert a negative drag on the efforts of the

global community to achieve the SDG target of 6.2 by 2030.

Although the infection and fatality rates from the pandemic are not as high in Nigeria compared to some other nations like the USA, India, Brazil and France, however, the Nigeria Centre for Disease Control (NCDC) reported that 2,837 persons have died out of the 209,298 confirmed COVID-19 cases as at October 17, 2021. These figures may have been underestimated considering the limited testing capacity, the weak surveillance system (Donde et al., 2020) and poor contact tracing experience in Nigeria. With the current third wave of the pandemic in Nigeria, coupled with the low vaccination rate against its spread in the country, there is the need to continue the campaign on hand hygiene and other non-pharmaceutical measures to the populace to control the spread of the pandemic in the country. Hand hygiene practice will not only slow down the rate of COVID-19 pandemic transmission but other infectious diseases, which will help to promote public health and save lives.

Unfortunately, studies have shown that WASH services before the pandemic were inadequate in Yenagoa. For example, Ohwo and Abotutu (2014) asserted that water provision for households in Yenagoa was inadequate and could increase the prevalence of waterborne diseases since it is a major requirement for the practice of basic sanitation and hygiene. Another study in Yenagoa also reported that only "44% of households have hand washing facilities with soap and water always at home; while 29% most times, 9% limited hygiene and 18% had no hygiene facility" (Ohwo, 2019). With the pandemic exerting serious stress on the people and the need for frequent hand hygiene has been canvassed and stressed to limit the spread of the pandemic, it is imperative to determine whether there is an improvement in hand hygiene behaviour among the people in Yenagoa.

Since the outbreak of the COVID-19 pandemic, not much has been found in the literature that addressed issues of household hand hygiene behavioural change, especially in Yenagoa. This study is therefore apt, as the findings would reveal whether the citizens have embraced and internalized the practice of regular hand washing in Yenagoa. Also, it will enable health officials and policymakers to know how effective the campaigns for sustainable hand hygiene had been amid the prowling pandemic and take informed decisions on the way forward. This study is, therefore, aimed at assessing hand hygiene behavioural change amongst the people of Yenagoa amid the COVID-19 pandemic. This will reveal whether there have been significant changes in hand hygiene practices among households in Yenagoa since the outbreak of the pandemic.

2.0 METHODOLOGY

2.1 Description of the Study Area

Yenagoa is the capital of Bayelsa State that was created in 1996. It is located in the Niger Delta region of Nigeria and lies within "latitudes 4° 55' and 5° 02' north of the Equator and longitudes 6° 15' and 6° 25' east of the Greenwich meridian (Figure 1) (Ohwo, 2019). "The city experiences an Equatorial climate with two distinct seasons-wet and dry. The mean annual rainfall is about 3,000mm, and the monthly mean temperature of about 28°C. Since Yenagoa became the capital of Bayelsa State, the population has increased remarkably to 350,000 people in 2019 from about 50,000 people in 1991" (Ohwo, 2021). The increase in population has put pressure on available WASH facilities and other infrastructure in Yenagoa as the rate of facilities provision lag behind population growth. The inadequate WASH services have impacted on the prevalence of waterborne diseases in Yenagoa since some households depend on unsafe water sources and practice poor sanitation and hygiene (Ohwo, 2019).

The index case of the COVID-19 pandemic in Bayelsa State was recorded in April 27, 2020, which has grown to a total of 1,227 confirmed cases with 28 deaths as at October 17, 2021 (NCDC, 2021). It is therefore necessary to assess the hand hygiene behaviour of households in order to control the spread of the pandemic and other infectious diseases in the city and Bayelsa State in general. This necessity prompted the study.

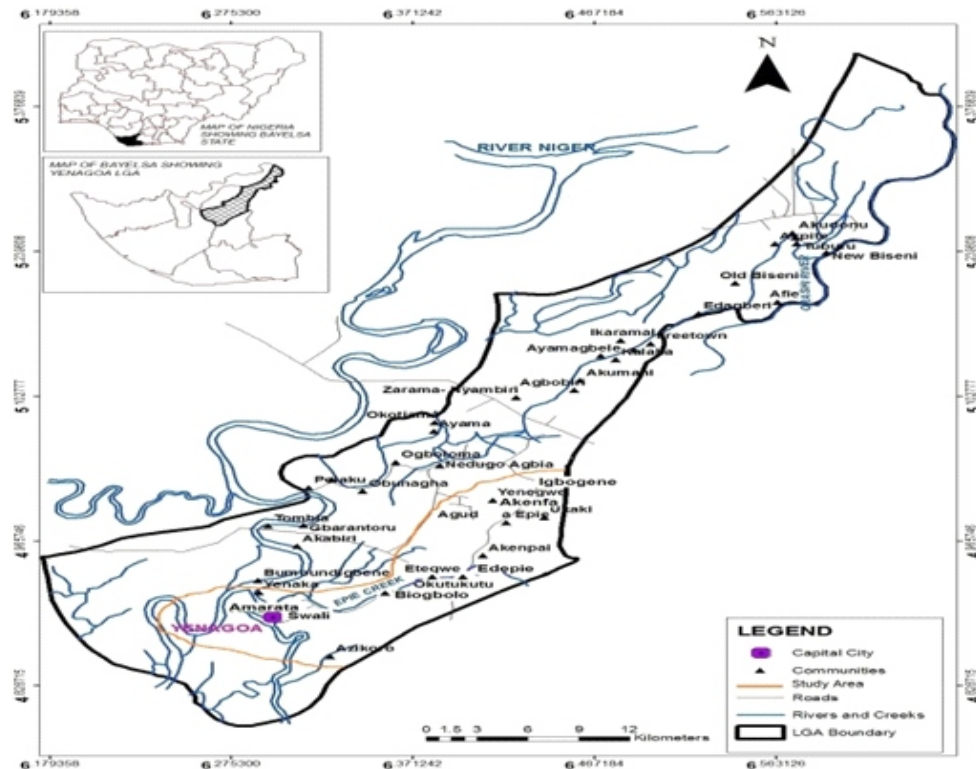


Figure 1: Yenagoa Local Government Area Showing the Study Area (Ohwo, 2019)

2.2 Research Design and Data Collection Method

The cross-sectional survey research design was employed in the study that includes the administration of a set of questionnaires and physical field observation of household's water and hygiene facilities in Yenagoa. The population for the study was the entire households in Yenagoa, which was estimated to be 87,500 based on the projected 350,000 population, using an average of four persons per household. The sample size for the study was 400 households, which was determined using the Krejcie and Morgan (1970) equation, while the multi-stage sampling technique was adopted to randomly select the households. Firstly, the 20 communities that made up Yenagoa were structured into four zones. Secondly, each of the four zones was allotted 100 sets of questionnaires due to the inability to obtain a reliable population figure of the respective four structured zones. Thirdly, to administer the allotted questionnaire in each zone, the systematic sampling technique was used at every five houses interval.

The direct physical method of questionnaire administration was adopted, and each copy of the questionnaire was administered by hand to the household head that was present at the time of visit, with the aid of five research assistants who were duly instructed. The questionnaire was retrieved immediately after it had been filled. The questionnaire was divided into four sections -A, B, C and D. Section A focused on demographic characteristics of the respondents; section B

contained questions on the status of water supply and hygiene facilities of households before and amid the COVID-19 pandemic; section C was on frequency of hand washing before and amid COVID-19, which was assessed using three rating scales of 'regularly, occasionally and do not; while section D focused on the constraints militating against hand hygiene behavioural change amid COVID-19 pandemic, which was assessed using the "Likert scale of strongly agreed, agreed, disagreed and strongly disagreed". In addition to the administered questionnaire, physical inspection of households' water and hygiene facilities was carried out to ascertain the claims of households. Because of the difficulties in observing all households hand hygiene behaviour at all times, the presence of water, soap and hygiene facility at home was used as a proxy for good hand hygiene intentions and behaviour. The obtained data were analyzed using tables, percentages and paired t-test statistics, which was used to test the hypothesis that there was no significant difference in the frequency of hand washing before and amid the COVID-19 pandemic in Yenagoa, using SPSS, version 25.

3.0 RESULTS AND DISCUSSION

3.1. Demographic Characteristics of Respondents

Of the 400 sets of questionnaires administered, 391 (97.75%) were retrieved and used for the study. Table 1 revealed the demographic characteristics of the respondents. The responses to sex showed that male respondents were 250 (63.94%), which was more than the female respondents of 141 (36.06%). Although more male respondents were sampled, however, the responses represented the views on hand hygiene practices of both sexes. The age distribution showed that 273 (69.82%) respondents were 40years and below, while 39.18% were above 40years. The age range with the highest responses (36.06%) was below 25years and the lowest (6.14%) was above 65 years. The age structure is an indication that the population is youthful, which probably accounts for the low recorded infection and death rates from COVID-19 in Yenagoa. On marital status, single respondents had the highest proportion of 48.08%, which was followed closely by 47.31% for married respondents; while the lowest proportion (2.30%) was recorded each for divorced and widowed respondents, respectively. The household size with the highest (39.90%) responses was 4-6 persons; while 10 and above household size had the lowest proportion (8.70%). This means that about 62% of the households in Yenagoa have four and above household size. By implication, there might be a high probability of the spread of the pandemic should a member of a household contract COVID-19.

The educational status revealed that about 98% of the respondents had formal education. Those with secondary education had the highest proportion of 50.64%, followed by tertiary education, 43.48%; primary, 3.58% and no formal education had the lowest responses of 2.30%. This shows that a reasonable number of the respondents are enlightened enough to know the importance of hand hygiene. The occupational structure revealed that the respondents represented the major sectors of the economy-public and private, as 19.44% were self-employed, 15.86%, civil service, 11%, private sector, 25.58%, business and 28.13% others. This structure is an indication that most respondents probably have contact with several other persons daily, which makes it imperative for respondents to frequently practice hand hygiene, especially during the pandemic. Although most of the respondents were employed, however, the monthly income suggests that most of the respondents are low and middle-income earners, as 89.77% earned N150, 000 and below, with 52.69% earning below N50, 000 and only 10.23% earned above N150, 000. Since most of the respondents are either low or middle-income earners, they may be faced with the challenge of providing basic hand hygiene facilities at home, which could hinder hand hygiene behavioural change.

Table 1: Demographic Characteristics of Respondents

S/N	Variable	Response	Frequency	Percentage (%)
1	Sex	Male	250	63.94
		Female	141	36.06
2	Age	Below 25 yrs	141	36.06
		25- 40 yrs	132	33.76
		41-65 yrs	94	24.04
		Above 65 yrs	24	6.14
3	Marital Status	Married	185	47.31
		Single	188	48.08
		Divorced	9	2.30
		Widow/Widower	9	2.30
4	Household size	1-3	147	37.60
		4-6	156	39.90
		7-9	54	13.81
		10 and above	34	8.70
5	Educational Status	No formal Education	9	2.30
		Primary	14	3.58
		Secondary	198	50.64
		Tertiary	170	43.48
6	Occupation	Self-employed	76	19.44
		Civil service	62	15.86
		Private sector	43	11.00
		Business	100	25.58
		Others	110	28.13
7	Income per month	Below N50, 000	206	52.69
		N50, 001-N150,000	145	37.08
		Above N150,000	40	10.23

Source: Author's Fieldwork, 2021

3.2. Water Supply and Hygiene Services before and Amid COVID-19 Pandemic

The responses to water supply and hygiene services are presented in Table 2. The table revealed that the major source of domestic water supply before and amid the COVID-19 pandemic was groundwater. The responses showed that 41.69% and 43.48% of households used groundwater before and amid the COVID-19 pandemic, respectively. Although the difference in the use of groundwater was negligible, however, there was about a 6% difference in the use of surface water before (8.95%) and amid the pandemic (2.30%). The reduction in the use of surface water during the pandemic may have been influenced by the realization through public health education that surface water is more susceptible to pollution and could harbour infectious diseases.

The responses also revealed that the proportion of households with major water sources located on-premises increased from 39.30% before the pandemic to 45.52% during the pandemic. Despite the increase in the number of households with water connection on-premises, however, the proportion of households with "total water collection time more than 30 minutes for a round trip, including queuing" increased from 13.30% before the pandemic to 18.93% during the pandemic. By implication, the number of households with at least basic water services dropped by 5.63% during the pandemic, contrary to the expected increase. This situation may affect some households

hand hygiene behaviour since access to water supply has been reduced. The major reason for the reduction in the water supply may be attributable to poor investment in WASH and other essential services, which has been made worse during the pandemic (WHO & UNICEF, 2021). This explains why only 58.31% and 58.56% of households have above 50 litres of water supply per day before and amid the pandemic, respectively. The 41.43% of households that had less than 50 litres are most unlikely to sustainably practise hand hygiene. Responses to the quality of water supply from major water sources followed a similar pattern to the quantity of water supply, as the proportion of households that perceived their water supply as either very adequate or adequate before and amid the pandemic were 74.43% and 76.98%, respectively. This is understandable because the major sources of household water supply before and amid the pandemic were largely the same. This shows that not much progress has been made in improving the quality of water supply to households amid the pandemic.

Despite the inadequacies in the quantity and quality of water supply to households, the cost of water was fairly high, since the majority of the sampled households were classified as low income or middle-income earners (Table 1). About 36% of households spent an estimated N100 per day (about N3, 000 a month) before and amid the COVID-19 pandemic. With a national minimum wage of N30, 000 per month, such an amount may be considered high for low-income earners. This probably accounts for the seemingly unchanged cost of water supply amongst households before and amid the pandemic. It should be noted, however, that the amount of money households spent on water per day is a function of the household size, income and major source of water supply.

To achieve good hand hygiene practices, a hygiene facility with soap and water must be present at home always. Responses to the availability of hand hygiene facilities indicated that about 39% and 50% of households had "hand washing facility with soap and water at home" always, before and amid the pandemic, respectively. This was an 11% improvement during the pandemic. In addition, another group of about 27% and 28% households had "hand washing facility with soap and water at home" sometimes, before and amid the pandemic, respectively. The response pattern suggests that hand hygiene practices improved amongst households in Yenagoa, amid the pandemic, since the presence of a hand washing facility, water and soap at home was used as a proxy for good hand hygiene behaviour.

Table 2: Status of Water Supply and Hygiene Services before and amid COVID-19 Pandemic

S/N	Questionnaire Variable	Response Variable	Responses (%)	
			Before	Amid
1	The major source of domestic water supply	Surface water (stream, lake and river)	35 (8.95)	9 (2.30)
		Groundwater (borehole and well)	163 (41.69)	170 (43.48)
		Pipe borne water	129 (32.99)	146 (37.34)
		Water vendor	45 (11.51)	47 (12.02)
		Others	19 (4.86)	19 (4.86)
2	Distance to the major water source	Located on-premises	154 (39.39)	178 (45.52)
		The total collection time is less than 30 minutes for a roundtrip including queuing	185 (47.31)	139 (35.55)
		The total collection time is more than 30 minutes for a roundtrip including queuing	52 (13.30)	74 (18.93)
3	Quantity of water supply per household per day	Above 100 litres	119 (30.43)	124 (31.71)
		51- 100 litres	109 (27.88)	105 (26.85)
		20 – 50 litres	129 (32.99)	124 (31.71)
		Less than 20 litres	34 (8.69)	38 (9.72)
4	Quality of water supply from the major water source	Very adequate	100 (25.58)	127(32.48)
		Adequate	191 (48.85)	174 (44.50)
		Inadequate	86 (21.99)	71 (18.16)
		Very Inadequate	14 (3.58)	19 (4.86)
5	Cost of water supply per household per day	Above N100	139 (35.55)	140 (35.81)
		N51- N100	89 (22.76)	92 (23.53)
		N20 – N50	79 (20.20)	72 (18.41)
		Less than N20	84 (21.48)	87 (22.25)
6	Availability of hand hygiene facility	Hand washing facility with soap and water at home always	153 (39.13)	195 (49.87)
		Hand washing facility with soap and water at home sometimes	104 (26.60)	110 (28.13)
		Hand washing facility without soap and/ or water	55 (14.07)	43 (11.00)
		No hand washing facility	79 (20.20)	43 (11.00)

Source: Author's fieldwork, 2021

3. 3: Frequency of Hand Washing before and Amid COVID-19 Pandemic

The responses to the frequency of hand washing as presented in Table 3 were used to determine the hand hygiene behavioural change amongst households in Yenagoa, amid the COVID-19 pandemic. The rating scale adopted for the assessment was regularly, occasionally and do not. The table revealed that there has been an improvement in the frequency of hand washing before and after eating. For example, the percentage of respondents that washed their hands regularly before and after eating increased by 12.54% (70.84% to 83.38%) before and amid the pandemic, respectively. This situation was better than what was reported in a study in Gaza, where only 65% of respondents washed their hands regularly before eating (UNICEF & PHG, 2010). Although before the pandemic 6.39% of respondents indicated, “do not”, however, amid the pandemic no respondent indicated, “Do not”. This simply means that all respondents have seen the need to wash their hands before and after eating. This practice could go a long way to act as a barrier to the transmission of the pandemic and other infectious diseases. Similarly, the proportion of respondents that washed their hands

regularly after using the toilet increased from about 80% before the pandemic to 87% amid the pandemic. This statistic was better than what was reported for Mbeere, Kenya, where only 59.2% washed their hands always after using the toilet (Njiru et al., 2016).

However, surprisingly, the number of respondents that washed their hands regularly after cleaning children excreta decreased from 78.52% before the pandemic to 77.24% amid the pandemic; while 11.25% of respondents do not wash their hands. This behaviour could reduce the gains achieved in hand washing after using the toilet. This trend led to the conclusion by a study that, despite the global pandemic it appeared difficult to sustain improved hand hygiene behaviour (Moore et al., 2021).

The responses in Table 3 have also revealed that about 70% of the respondents either wash their hands regularly (42.20%) or occasionally (28.13%) after sneezing amid the pandemic, which was an improvement from about 60% before the pandemic. Despite the improvement, significant proportions (about 30%) of the respondents do not wash their hands after sneezing. This act could encourage the spread of the COVID-19 pandemic if droplets that get to the hands of infected persons are not washed thoroughly. In the same vein, the proportion of respondents that washed their hands regularly after nose-wiping increased to 46.29% amid the pandemic from 32.99% before the pandemic; while about 28% of other respondents do not wash their hands. Since food intake is a veritable source of food-borne diseases, it is expected that the act of hand washing should be religiously carried out before and after cooking to prevent food contamination. Although the proportion of respondents that washed their hands regularly before and after cooking increased marginally from 51.92% before the pandemic to 56.52% amid the pandemic, about 17% of the respondents do not wash their hands amid the pandemic. This group of respondents stands a greater risk of contracting food-borne diseases. Similarly, 56.27% of the respondents regularly wash their hands before and after eating fruits amid the pandemic as against 51.92% before the pandemic.

One of the most auspicious moments for hand-washing is after handling dirty materials and surfaces, which has been reemphasized by health authorities to curb the spread of the pandemic. Hence, 82.10% of respondents regularly wash their hands after handling dirty materials and surfaces amid the pandemic, from 66.24% before the pandemic, which is about a 16% increase. This figure is a sharp contrast to what was reported in an earlier study in Ibadan, where only 19.1% of respondents washed their hands always after handling dirty material (Orimoleye et al., 2015). Although the number of respondents who do not wash their hands after handling dirty materials and surfaces decreased reasonably by about 7%, however, 3.84% of the respondents still do not wash their hands after handling dirty materials and surfaces.

Although social distancing, lockdowns and regular hand washing were recommended by health authorities to break the transmission chain of the pandemic, however, only 56.27% of the respondents wash their hands regularly after returning from work or outing during the pandemic. Even though this percentage was an improvement on the 39.13% before the pandemic, a large proportion (43.73%) of the respondents either wash their hands occasionally (32.48%) or do not (11.25%) wash their hands after returning from work or outing. This hand hygiene behaviour may increase the risk of contracting the pandemic by those who do not wash their hands regularly because going out to work or other outings increase the chances of having contact with people. Since contagious diseases can easily spread from person to person, it is required that caregivers of the sick should regularly wash their hands as a precaution against contracting diseases, especially during the pandemic. Despite this fact, only 58.31% and 66.24% of respondents wash their hands regularly before and during the pandemic after caring for the sick. Therefore, respondents (33%) who do not wash their hands or wash occasionally after caring for the sick during the pandemic have higher exposure to infectious diseases.

The paired t-test statistical analysis was calculated using the data in Table 3. The test revealed that the calculated paired t-test was 22.229 and the *p*-value was .000. Since the *p*-value was lower than the alpha level of 0.05, it means that there was a significant difference in the frequency of hand washing before and amid the COVID-19 pandemic in Yenagoa. This shows that hand hygiene behaviour among the people increased amid the pandemic. This finding is in agreement with an earlier study, which reported that respondents' declared frequency of hand washing during the pandemic was significantly higher (6-15 times) than before (3-10 times) the pandemic (Głabska et al., 2020). However, there is still room for improvement as a reasonable number of people do not practice regular hand hygiene amid the pandemic.

Table 3: Frequency of Hand Washing before and amid COVID-19 Pandemic

S/N	Questionnaire Variable	Response Variable	Responses (%)	
			Before	Amid
1	Before and after eating	Regularly	277 (70.84)	326 (83.38)
		Occasionally	89 (22.76)	65 (16.62)
		Do not	25 (6.39)	0 (0.00)
2	After using the toilet	Regularly	313 (80.05)	342 (87.47)
		Occasionally	73 (18.67)	49 (12.53)
		Do not	5 (1.28)	0 (0.00)
3	After cleaning of children excreta	Regularly	307 (78.52)	302 (77.24)
		Occasionally	35 (8.95)	45 (11.51)
		Do not	49 (12.53)	44 (11.25)
4	After sneezing	Regularly	115 (29.41)	165 (42.20)
		Occasionally	120 (30.69)	110 (28.13)
		Do not	156 (39.90)	116 (29.67)
5	Nose wiping	Regularly	129 (32.99)	181 (46.29)
		Occasionally	99 (25.32)	100 (25.58)
		Do not	163 (41.69)	110 (28.13)
6	Before and after cooking	Regularly	203 (51.92)	221 (56.52)
		Occasionally	81 (20.72)	103 (26.34)
		Do not	107 (27.37)	67 (17.14)
7	Before and after eating fruits	Regularly	203 (51.92)	220 (56.27)
		Occasionally	82 (20.97)	108 (27.62)
		Do not	106 (27.11)	63 (16.11)
8	After handling dirty materials and surfaces	Regularly	259 (66.24)	321 (82.10)
		Occasionally	86 (21.99)	55 (14.07)
		Do not	46 (11.76)	15 (3.84)
9	After returning from work or outing	Regularly	153 (39.13)	220 (56.27)
		Occasionally	124 (31.71)	127 (32.48)
		Do not	114 (29.16)	44 (11.25)
10	After caring for the sick	Regularly	228 (58.31)	259 (66.24)
		Occasionally	99 (25.32)	93 (23.79)
		Do not	64 (16.37)	39 (9.97)

Source: Author's Fieldwork, 2021

3.4. Constraints Militating against Hand Hygiene Behavioural Change amid COVID-19

The "Likert scale of strongly agreed, agreed, disagreed and strongly disagreed" was used to determine the perception of respondents on some of the constraints militating against hand hygiene behavioural change amid COVID-19 in Yenagoa (Table 4). For example, 85.68% of respondents either strongly agreed (35.04%) or agreed (50.64%) that ignorance of the effectiveness of hand washing in protecting infectious diseases is one of the constraints militating against hand hygiene

behavioural change amid COVID-19 in Yenagoa. This is an overwhelming indication that people should be educated on the importance of hand hygiene behaviour. It should be noted, however, that education alone is not a sufficient condition for the practice of regular hand hygiene, but access to water supply influences the intention for hand hygiene behaviour. Hence, 69.06% of the respondents either strongly agreed (34.53%) or agreed (34.53%) that poor access to water supply militates against hand hygiene behavioural change amid COVID-19 in Yenagoa. This assertion was confirmed in Gondar, Ethiopia, where it was reported that those who have hand washing facilities were 8.7 times more likely to practice hand hygiene than those that do not (Yallew et al, 2012).

In addition to poor access to water supply, the cost of hygiene facilities, water and soap have impeded regular hand hygiene behaviour in Yenagoa. For example, only 19.69% and 7.42% indicated disagreed and strongly disagreed, respectively that the cost of providing hygiene facilities, water and soap militate against regular hand hygiene practices in Yenagoa. Considering the income status (low and medium) of the majority of the respondents the cost of providing hygiene facilities, water and soap may be challenging to a significant number of the citizens. This situation calls for adequate water provision and economic empowerment of the people to create the enabling environment to stimulate hand hygiene behaviour. Also, the majority (75.70%) of the respondents either strongly agreed (28.13%) or agreed (47.57%) that the poor habit of regular hand washing among the people is one of the constraints militating against hand hygiene behavioural change amid COVID-19 in Yenagoa. Even though some of the citizens may be aware of the importance of regular hand washing in checking the spread of the pandemic, they find it difficult to carry out this simple life-saving task due to the poor habit of regular hand washing developed over the years. This calls for the early introduction of regular hand washing to children in their formative years so that they can form the habit of regular hand hygiene throughout their life.

Furthermore, the conspiracy theory that COVID-19 does not exist has made some people deliberately refuse to obey public health advice on hand hygiene. For example, 29.67% and 34.53% of the respondents strongly agreed and agreed, respectively that disbelief in the existence of COVID-19 and the deliberate refusal of some people to obey public health advice militate against hand hygiene behavioural change amid COVID-19 in Yenagoa. A similar observation was made in a study in Wa, Ghana, where the authors reported that despite the provision of hand washing facilities at the entrance of the shops studied, 91.3% of customers refused to wash their hands before entering (Fielmua et al., 2021).

Table 4: Constraints Militating against Hand Hygiene Behavioral Change amid Covid-19

S/N	Questionnaire Variable	Response Variable	Number of Respondents	Percentage Response (%)
1	Ignorance of the effectiveness of hand washing in protecting infectious diseases	Strongly Agreed	137	35.04
		Agreed	198	50.64
		Disagreed	33	8.44
		Strongly Disagreed	23	5.88
2	Poor access to water supply	Strongly Agreed	135	34.53
		Agreed	135	34.53
		Disagreed	72	18.41
		Strongly Disagreed	48	12.28
3	Cost of providing hygiene facility, water and soap	Strongly Agreed	150	38.36
		Agreed	135	34.53
		Disagreed	77	19.69
		Strongly Disagreed	29	7.42
4	The poor habit of regular hand washing among the people	Strongly Agreed	110	28.13
		Agreed	186	47.57
		Disagreed	86	22.00
		Strongly Disagreed	9	2.30
5	Disbelieve in the existence of COVID-19 and deliberate refusal to obey public health advice on hand hygiene	Strongly Agreed	116	29.67
		Agreed	135	34.53
		Disagreed	106	27.11
		Strongly Disagreed	34	8.70

Source: Author's fieldwork, 2021

4.0 CONCLUSION

The findings from the study have revealed that the statuses of water supply, hygiene facilities, frequency of hand washing before and amid the COVID-19 pandemic were unsatisfactory. For example, only 49.87% of households had a hand washing facility with soap and water at home always amid the pandemic. This situation does not encourage regular hand washing. It should be noted, however, that despite the unsatisfactory hand hygiene behaviour among respondents, hand hygiene practice among the people in Yenagoa has improved from the level it was before the pandemic. Hence, the t-test statistic revealed that there was a significant difference in the frequency of hand washing before and amid the COVID-19 pandemic in Yenagoa. This shows that hand hygiene behaviour among people has improved amid the pandemic. However, there is still room for improvement as a reasonable number of people still do not practise regular hand hygiene amid the pandemic due to some identified constraints. These constraints could be addressed by mass education (using all available media) and aggressive campaigns on the existence of COVID-19 and the need for regular hand hygiene by all; provision of water and hygiene services for the people by the government and early introduction of children to regular hand washing, which could make them develop a sustainable habit of hand hygiene.

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STATUS OF INTESTINAL PARASITIC INFECTIONS AMONG PUBLIC PRIMARY SCHOOL CHILDREN IN THREE COMMUNITIES IN SAGBAMA LOCAL GOVERNMENT AREA, BAYELSA STATE, NIGERIA

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Abstract

Required epidemiological data on the prevalence of Intestinal Parasitic Infections (IPIs) and identification of associated risk factors in different regions is a prerequisite to developing appropriate control management. This study was aimed at determining the prevalence of intestinal parasites among primary school children age in public primary schools in three communities (Adagbabiri, Sagbama and Tungbo) in Sagbama Local Government Area, Bayelsa State, Nigeria. Pupils in each particular class in a school were randomly selected. 335 stool samples were analyzed for intestinal parasites ova/larvae using the direct method and formol ether concentration technique. 109(32.5%) tested positive for IPIs with more males (37.1%) children than females (28.8%) children were infected. Seven species of parasites were identified; *Entamoeba histolytica* 28(8.4%), *Ascaris lumbricoides* 19(5.7%), *Strongyloides stercoralis* 16(4.8%), *Trichuris trichiura* 14(4.2%), Hookworm 13(3.9%) *Schistosoma mansoni* 10(3.0%) and *Entamoeba coli* 9(2.7%) in this order. Multiple infections were also encountered recording 8(2.4%). Age bracket 5-7 years had the highest prevalence of 66(61.1%). There was no significant difference ($P > 0.05$). Intestinal parasite infection is still a public health problem among school children in Sagbama Local Government Area. Therefore the need for improvement of sanitation, health education, provision of potable drinking water and mass deworming exercises through Community Based Intervention (CBT) is essential.

Keywords: intestinal parasites, primary school children, prevalence, and Sagbama

INTRODUCTION

Parasitic infections are chronic and insidious diseases producing long-term effects on man. They are among the most common and neglected infectious diseases worldwide (WHO, 2020), hence intestinal parasitosis refers to a group of diseases caused by one or two or more species of protozoa's, cestodes, nematodes, trematodes, several infectious diseases are caused by members of these previously listed organism having been considered, as a neglected tropical disease (NTDs) (Salvioli et al., 2006). The helminth *Trichuris trichiura* (whipworm), *Ascaris lumbricoides* (roundworm), *Ancylostomaduodenale* (hookworm), as well as the protozoa *Entamoeba histolytica* have been observed to cause infections in 48 million people respectively (CDC, 2020). The prevalence of intestinal parasitic infections varies considerably from place to place, concerning the pattern of transmission of the disease (UNICEF, 2011). Public health specialists are concerned that these infectious impair children's growth and development (Utume et al., 2015). Despite the improvement of the quality of medical service in terms of diagnosis of parasitic disease, most parasitic diseases are

still considered a major challenge for health centres and staff in many developing countries. Major contributors to the high burdens of intestinal parasites include poverty, poor environmental sanitation, personal hygiene, lack of portable drinking water and inadequate healthcare, which characterizes most communities in developing countries including Nigeria, (Ekunday et al., 2007; Wajbastoma et al., 2005). The treatment of intestinal parasites is by administering antihelminthic drugs: helminths and protozoa vary among organisms, as they possess comparatively different stages of infection that may require different substances or drugs to rupture the development of their pathogenicity which include; metronidazole (giardiasis), mebendazole (ascariasis and trichuriasis), nitronidazole (amoebiasis). Other control methods include proper washing of hands with soap and water, washing of vegetables, which is also necessary to curb the ingestion of *A. lumbricoides*, *T. trichiura*, Hookworms and others. Control measures can also be through proper disposal of faecal waste, and sewage waste and also avoiding faecal contamination of food and water, controlling insects that might come in contact with faeces and infect foods e.g. cockroach houseflies etc., treatment of drinking water before drinking. Most of all the habit of deworming destroy the infective stage of these parasites.

In Nigeria, young children are reported to be affected by intestinal parasites compared to adults due to their increased nutritional requirement and their less developed immune system. Intestinal parasitic infection in this age group has been linked with significantly reduced growth and increase risk of protein/energy malnutrition, iron deficiency, anaemia and reduced cognitive/psychomotor development (Hotez et al., 2014). The public health importance of gastrointestinal parasites is due to their high morbidity and motility rate in school children and women during their childbearing years in Nigerian towns and villages (Odu et al., 2012). These are mostly the major problems in a rural settlement in Nigeria because of their poor socio-economic status and lack of basic amenities such as water and toilet facilities (Okon & Oku, 2009). Nigeria has a high number of cases of intestinal parasitic infections with about 29 million infected cases and about a 101million people are at risk of infection.

Several factors ranging from political, demographic, social-economic environmental, climatic and cultural trends are known to determine the transmission of intestinal parasitic infections, directly or indirectly; high infection prevalence has been correlated to coming in contact with the environment in various ways. However, the major limitation to intestinal parasite control has been limited due to the lack of public health educations, modern health facilities and toilet facilities. In Nigeria, young children are reported to be infected by intestinal parasites compared to adults due to their increased nutritional requirement and their less developed immune system. Intestinal parasitic infection in this age group has been linked with significantly reduced growth and increased risk of protein/energy malnutrition, iron deficiency, anaemia and reduced cognitive/psychomotor development. Within this context, the present study aims to investigate the prevalence of intestinal parasitic infections among primary school children in Adagbabiri, Sagbama and Tungbo communities in the Sagbama Local Government Area, Bayelsa State, Nigeria.

Materials and Methods

Study Area

This study was conducted in three communities (Adagbabiri, Sagbama and Tungbo) in Sagbama Local Government Area, Bayelsa State, Nigerian, from March to May 2021. The villages are located Adagbabiri (512°6.246''N and 6.6°27.558'' E), Sagbama (5°9'11.422"N, 6°11'45.744"E) and Tungbo (57°9.902'' N and 6, 100.786'' E). The community experienced two seasons; the rainy season which starts from April to October and the dry season which is from November to March. The occupation of the inhabitants comprises mainly farmers, a few fishermen, businessmen, trading, public servants, civil and retired civil servants. Houses are built mainly with blocks and some are

made of either bamboo or plywoods. Their sources of drinking water are rivers, boreholes, taps and rainwater. The majority of the community inhabitants dispose of their faeces and waste directly in these streams, which also serve as a source for their domestic activities such as swimming, washing, bathing, fishing, fetching water for domestic purposes. The communities have one health centre each.

Consent and Approval

Ethical clearance was obtained from the various community chiefs, community elders and Community Development Committee (CDC) before the commencement of the research. Written informed consents were obtained from the CDC and Informed consents were given by community chiefs, elders before the study. Before the study, the participants were properly enlightened on the aim, objectives and benefits of the public health significance as well as the protocols of the study.

Sample Collection

A total of 335 stool samples were collected from consented parents of primary school children from ages 5-16 years. Structural questionnaires were used to collect data such as age, gender, class, source of drinking water, type of toilet facilities, water contact pattern, hand hygiene practice, personal hygiene as well as hand washing pattern before handling raw fruits raw and cooked vegetables(foods) and after using the toilets. The criteria needed to describe this population were primary school children from 5-16 years of age. The headmaster, headmistress, and teachers in the primary schools were enlightened on the public health significance in both schools. Further information was passed to the parents of the primary school children through town cries. Parents were allowed to withdraw their children at any time

Sample Analysis

Stool samples were macroscopically examined for colour, consistency and presence of blood, mucus or pus (Cheesbrough, 2005). 1g of stool samples were emulsified in about 4g of 10% formol water contained in a screw-cap bottle pipette into test tubes of equal volume and placed in a centrifuge and allowed to spin at 3,000 rpm for 5 minutes. The test tubes were then removed from the centrifuge and decanted. 7ml of 10% formol water was then added to the test tubes and then 3ml of diethyl ether was also added. A stopper was used to cover the test tubes and mixed for 15 seconds. The stopper was then loosened with the aid of tissue and then centrifuged for 3,000 rpm for 5 minutes. A stick with cotton wool placed at the edges was used to loosen the layer of faecal debris from the side of the tube and inverted to discard the ether, faecal debris and formol water leaving the sediment inside the test tubes. The bottom of the tube was tapped to re-suspend and mix the sediments. The sediments were collected with the aid of a Pasteur pipette and placed on a grease-free glass slide with a small drop of iodine. A cover glass slip was placed on the slides and viewed under a light microscope using the x10 and x40 objectives for the presence of parasite cysts, larvae and eggs.

Sampling for Snails

Examination of water for gastropod fauna bodies in the communities was employed using handpicking and scooping nets. Collected snails were kept in separate specimen bottles containing 70% alcohol and labelled accordingly for subsequent examination and identification.

Data Analysis

Collected data were analyzed using percentage prevalence and ANOVA for significant differences among the sampled population in the four communities.

Results

A total of 335 consented primary school children were examined for intestinal parasites species in three communities (Adagbabiri, Sagbama and Tungbo. A total of 109(32.5%) school children tested positive for intestinal parasitic infections. The result recorded prevalence of intestinal parasites with *Entamoebahistolytica* 28 (8.4%), *Ascarislumbricoides* 19 (5.7%), *Strongyloidesstercoralis* 16 (4.8%), *Trichuristrichiura* 14 (4.2%), Hookworm 13 (3.9%) *Schistosomamansoni* 10 (3.0%) and *entamoeba coli* 9 (2.7%), in this order (Table 1). Mixed infection was also recorded at 8(2.4%) across the communities. Concerning communities, Tungbo had the highest prevalence in the study recording 46(62.6%) out of the 86 school children sampled. This was followed by Adagbabiri recording 40(46.5%) out of the 74 examined stool samples while the least was recorded in Sagbama with 23(13.1) out of the 175 stool samples examined (Table 1). The result showed no significant difference at $P < 0.05$ among sampled population. Also, there was no significant difference at $P < 0.05$ across the infected population in the three communities. ANOVA comparing the sampled populations across the three communities showed significant differences with the infected population.

In table 4.2 below, the result obtained from the three communities showed that 151 males participated and 184 females participated in the study with more males (37.1%) infected than females(28.8%).

Out of 151 males examined, in Adagbabiri, 9 males were examined 8 (75.9%) showed positive; in Sagbama, 42 males were examined, 26 (61.90%) tested positive and Tungbo, 11 males were examined, 9 (81.82%) showed least positive prevalence. Out of 53 females examined, 40 (75.47%) tested positive for *intestinal parasitic* infections among the three communities. In Adagbabiri 5 females were examined, 5 (100.00%) showed positive; in Sagbama, 33 females were examined, 21 (63.64%) showed positive and in Tungbo, 15 females were examined, 14(93.33%) showed the least positive prevalence in this order. There was no significant difference in the Gender-specific prevalence of males for intestinal parasitic infections between the sampled and infected population at $P < 0.05$ there was a significant difference in the Gender-specific prevalence for IPIs infection between the sampled and infected population at $P < 0.05$ (Table 2).

The results obtained in Table 3 shows that the prevalence of IPIs from the three communities showed that age brackets 5-7 (61.1%) recorded the highest prevalence in the study. This was followed by age brackets 8-10 (23.5%) and 14-16 (17.6%). The least was recorded in age brackets 11-13 (15.8%). Age brackets reported in related to community observed Tungbo recorded the highest rate of infection recording 62.2%. This was followed by Adagbabiri recording 46.5% while Sagbama recorded the least infection with 13.1%.

Source of drinking water, toilet facilities, washing of hands after using the toilets, washing of hands before meals, the pattern of waste disposal and washing of hands after waste disposal were also found to be associated with Intestinal parasitic infections, with higher prevalence recorded among the primary school-aged children that lack them both in school and at home, i.e. 72.50% and 64.52%. Prevalence of 63.08% and 89.61% was seen among school pupils who disposed of garbage at the river/stream and did not wash their hands. 88.89% was recorded among primary school children who drank the river. Prevalence of 83.28% was recorded among children who used water alone to wash their hands after defecation while 23.91% was recorded among those who used soap and water (Table 4).

Table 1: Prevalence of intestinal parasites affecting primary school children in Adagbabiri and Tungbo communities, Sagbama L.G.A., Bayelsa State, Nigeria

Communities	Intestinal Parasites Found										Prevalence (%)
	No. examined	No. infected	<i>A. lumbricoide</i> s	<i>E. coli</i>	<i>E. histolytica</i>	Hookworm	<i>S. stercoralis</i>	<i>T. trichiura</i>	<i>S. mansoni</i>	Mixed infections	
Adagbabiri	86	40	8(9.3%)	6(7.0%)	11(12.8%)	4(4.7%)	3(3.5%)	5(5.8%)	3(3.5%)	2(2.3%)	46.5
Sagbama	175	23	9(5.1%)	0(0)	4(2.9%)	7(4.0%)	2(1.1%)	1(0.6%)	0(0)	5(2.9%)	13.1
Tungbo	74	46	2(2.7%)	3(4.1%)	13(17.6%)	2(2.7%)	11(14.9%)	8(10.8%)	7(9.5%)	1(1.4%)	62.2
Total	335	109	19(5.7%)	9(2.7%)	28(8.4%)	13(3.9%)	16(4.8%)	14(4.2%)	10(3.0%)	8(2.4%)	32.5

Table 2. Prevalence of intestinal parasites among primary school children concerning gender in Sagbama Local Government Area, Bayelsa State, Nigeria

Communities	Gender							Prevalence (%)	
	Total no. Examined	Total no. Infected	Total Prevalence of Males and Females (%)	Total no. of Males Examined	Total no. of Females Examined	Total no. of Males Infected	Total no. of Females Infected	Males	Females
Adagbabiri	86	40	46.5	29	57	22	18	75.9	31.6
Sagbama	175	23	13.1	81	94	15	8	18.5	8.5
Tungbo	74	46	62.2	41	33	19	27	46.3	81.8
Total	335	109	32.5	151	184	56	53	37.1	28.8

Table 3: Prevalence of intestinal parasites among primary school children concerning age in Sagbama Local Government Area, Bayelsa State, Nigeria

Age groups in years	Adagbabiri		Sagbama		Tungbo		Total no. examined	Total no. infected	Prevalence (%)
	N.E	N.I	N.E	N.I	N.E	N.I			
5 to 7	30	25	66	9	12	32	108	66	61.1
8 to 10	19	9	42	7	20	3	81	19	23.5
11 to 13	27	6	40	7	28	2	95	15	15.8
14 to 16	10	0	27	0	14	9	51	9	17.6
Total	86	40	175	23	74	46	335	109	32.5

Key: N.E- Number Examined; N.I- Number Infected

Table 4. Pattern and Practices of primary school children that promote Transmission of Intestinal Parasitic Infections in sampled communities

Variables	No. examined	No. infected	Prevalence (%)
Source of drinking water			
Borehole	211	36	17.1
Community Tap	75	40	53.3
River	20	19	95.0
Hand-dug well	-	-	-
Stream	-	-	-
Rain	29	14	48.3
Treatment of Water at home			
Yes	195	40	20.5
No	140	69	49.3
Method of Treatment			
Chlorine	4	-	-
Boiling	15	-	-
Alum	71	21	29.58
Never	-	-	-
Toilet Facilities			
Water cistern	13	3	23.08
Pit latrine	62	40	64.52
Riverside	40	29	72.50
The pattern of Handwashing after using a toilet			
Soap and water	204	15	7.4
Ash and water	-	-	-
Water alone	131	94	71.8
Waste disposal pattern			

Discussion

The results obtained in this study showed that intestinal parasitic infection is common to all age groups and both sexes of pupils in public primary schools in the study locations. The results generally showed a level of intestinal parasitic infection in the studied population to be 32.3%. This result is higher than that obtained 31.6% in Jos North Local Government Area of Plateau State,

Nigeria (Ogwurike et al., 2010); Usip et al., 2017; Abah et al., 2015). However, the rate of infections encountered in this study is of great importance to the well-being and development of man, especially in children in whom they constitute a health problem (Rajeswari, et al., 1994; Usip & Matthew, 2015).

The result of this study is in agreement with the previous work by Chigozie et al. (2007) who observed a high prevalence of *A. lumbricoides* among the school children because of contamination of their hands with polluted soil, which often contains the infective eggs of the parasites, thereby enhancing transmission from hand to mouth. Specifically, Ascariasis can lead to acute abdominal emergencies. The prevalence of *Hookworm* infection also could be as a result of the children not wearing protective shoes while playing within and outside school premises in the study area as observed by (Thomas et al., 2014). *Hookworm* infections may result in iron deficiency anaemia which may be mild or life-threatening (WHO, 1990); Trichuriasis can result in under-nutrition, stunted growth and iron deficiency anaemia (Cooper, et al., 1990) Strongyloidiasis may lead to malabsorption syndrome in children. Entamobiasis can result in low cognitive functioning, diarrhoea, dysentery, abdominal pain and tenderness. Giardiasis is one of the most common parasites infecting cats, dogs and birds outline with (Inabo et al., 2000; Wosu and Onyeabor et al., 2014) observation. The pupils infected with *Schistosomamansoni* may have come in contact with infected water harbouring snail vector or swimming in contaminated water as the cyst thereby resulting in weakness in the body, loss of appetite, diarrhoea, loose or watery stools, stomach cramps, upset stomach, projectile vomiting (uncommon), bloating, excessive gas and burning. These health conditions are commonly seen presented by children in many Nigerian health clinics and hospitals as previously observed by Hotez and Kamath (2009) and Gimba and Diwan (2015).

The pupils in public primary schools in the study were heavily infected. This might be because Public Primary Schools have large hectares of land for football and farming which leads to the transmission of parasites from infected soil, and the government is not providing social amenities such as water system facilities to the public schools to ensure total eradication of these diseases. Also, teachers take care of the children in private schools more than in public schools. The government is not encouraging health education in public schools where these children can be educated on good hygiene practices and behavioural activities. It is also a result of parents not teaching their children about the dangers of playing in contaminated soils and walking barefooted (Usip & Nwosu, 2013).

The same six species of parasites were found in pupils of both types of school because all the pupils share more or less the same environmental conditions which allowed the transmission and persistence of the parasites. These socio-environmental factors which were observed during this study include inadequate sanitation, poor hygiene, walking barefooted in some cases, similarity in socio-cultural behaviour of the pupils, poor access to health care and glaring signs of poverty which previous workers (Chigozie et al., 2007; Akogun & Badaki, 1998) had observed in their studies.

Conclusion

The findings of this study has shown that seven intestinal parasites (*Entamoebahistolytica*, *Ascaris lumbricoides*, *Strongyloidesstercoralis*, *Trichuristrichiura*, *Entamoebahistolytica*, *Hookworm* and *Schistosomamansoni* were prevalent among children in public primary school in the three communities (Adagbabiri, Sagbama and Tungbo) in Sagbama Local Government Area, Bayelsa State, Nigeria. The presence of intestinal parasites in Sagbama Local Government Area. constitutes a major public health problem in the country. The data obtained from this study also provides data for understanding the epidemiological status of human gastrointestinal parasites in the area.

Recommendations

There is an urgent need for the health agencies in Sagbama Local Government Area of Bayelsa State and the Federal Government of Nigeria to step up efforts that will reduce the load to parasitic infections in the nation's primary schools and other institutions through the improvement of the nation's healthcare system, health education, regular diagnosis and identification and chemotherapy of infections in school-age children, these are possible and desirable, for they are fundamental investments in human development that will determine Nigeria's future.

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COMPARISON OF RAPID DIAGNOSTIC TEST AND MICROSCOPY TESTING OF MALARIA PARASITES AMONG PREGNANT WOMEN AND CHILDREN ATTENDING ANTENATAL CARE IN AGUDAMA HEALTH FACILITY IN YENAGOA LOCAL GOVERNMENT AREA, BAYELSA STATE, NIGERIA

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Abstract

The effectiveness of the Rapid Diagnostic Test (RDT) Kit was compared with that of microscopy for the evaluation of malaria infection in children and pregnant women in a health facility in Yenagoa, Bayelsa State, Nigeria. The study determined the prevalence of malaria in children and pregnant women; compared the sensitivity and specificity in children and the sensitivity and specificity in pregnant women attending health facilities in Yenagoa in Bayelsa State. A total of 191 patients (40 children and 151 pregnant women) were sampled for this purpose. The prevalence of infection observed for microscopy was 29(67.5%) in children and 24(15.9%) in pregnant women while RDT showed 5(12.5%) for children and 15(9.9%) for pregnant women. The evaluation of RDT showed low specificity of 11.1% but a high level of specificity of 25.0% for microscopy. This study showed that RDT was not sensitive as microscopy in the detection of malaria infection in the study area. Ministry of health and all families should ensure that contact with a mosquito bite is avoided to reduce the spread of malaria disease to pregnant women and children in the study area.

Keywords: rapid diagnostic test, microscopy, children and pregnant women

INTRODUCTION

Malaria is a life-threatening protozoan disease caused by malaria parasites belonging to the genus *Plasmodium*. Malaria is caused by *Plasmodium species* worldwide. The species of *Plasmodium* are *P. falciparum*, *P. Ovale*, *P. Vivax*, *P. Malarea* and the newly found species *P. knowlesi*. Malaria is most widely spread and is pathogenic of the human species, with untreated infections causing severe disease and death, more in developing countries particularly in young children and pregnant women (Miller et al., 1994 in Adeola et al., 2018). The emergence and spread of drug resistance to commonly used chemotherapeutics are the main factors contributing to this increasing burden and most of the mortality and morbidity are borne by children and pregnant women. Pregnant women and their infants are so susceptible to the infection. The malaria disease is preventable but is most often left unscreened and untreated (Adeola et al., 2018). According to an estimate, approximately 125 million pregnant women worldwide are exposed to the risks of malaria in pregnancy yearly, resulting in 200,000 infants' deaths (Olayemi et al., 2004).

Malaria is prevalent in poorer tropical areas of Africa where most malaria cases with nearly half of the world's population were at risk of malaria in 2016. Regions of South-East Asia, Eastern Mediterranean, Western Pacific and the Americas are also at risk (WHO, 2016). In 2016, 91 countries had ongoing malaria transmission with 216 million cases of malaria, up from 211 million cases in 2015 and the estimated number of malaria deaths did not change at 445,000 (WHO, 2016). More than 80% of the deaths worldwide occurred in Sub-Saharan African (WHO, 2016). In Nigeria, there is an estimated 142,054,940 at risk, 20,156,313 cases and 122,800 deaths estimated in 2016

(WHO, 2016). Malaria infection during pregnancy is particularly life-threatening throughout the world. Studies have reported that non-immune pregnant women are at high risk of malaria which could result in a high rate of miscarriages and causes over 10% of maternal deaths, severe anaemia, Low Birthweight and impaired foetal growth. An estimated 3 million suffered complications from low birth weight as a result of maternal malaria infection during pregnancy. There are 75,000-2,00,000 (5%-12%) of low birth weights directly due to malarial infections and 35% of preventable low birth weights (WHO, 2017). Again, one of the most common complications of malaria in pregnancy is anaemia and it harms the outcome of pregnancy (Kenti & Kwenti, 2016).

The clinical diagnosis of malaria widely used based on the symptoms of malaria is rather non-satisfactory. Accurate diagnosis and prompt treatment of malaria associated with pregnancy are essential to avert adverse pregnancy outcomes and so the WHO Test, Treat, Track Global Initiative becomes even more imperative in pregnancy (WHO, 2016). Wrong diagnoses might lead to presumptive medication and hence many patients leaving the health facility without the right treatment. The consequences of malaria in pregnancy range from maternal anaemia, low birth weight, spontaneous abortion, stillbirth among others (Tagbor et al., 2008). The treatment of these infections becomes paramount to effect in preventing potential risks of adverse pregnancy outcomes.

Several methods used in diagnosing malaria have a certain degree of accuracy which Microscopy has been the gold standard in malaria diagnosis. However, this is limited as a result of poor infrastructure and the need for individuals with expertise in microscopy who are not readily available in many health facilities in malaria-endemic areas like Nigeria, especially in Bayelsa State. Microscopic detection of malaria infection is about 75% in high transmission areas whereas, in low transmission areas, this method was reported to mix up to 88% of infections (Okell et al., 2009). In addition, microscopy was reported not to be sensitive, which could be due to lack of good quality reagents sometimes, well-maintained microscopes and it is time-consuming (Dhorda et al., 2012). Studies carried out in malaria-endemic areas showed better sensitivity of Rapid Diagnostic Tests (RDTs) as compared to microscopy (Minja et al., 2012).

The intermittent occurrence of malaria infection among humans especially pregnant women and children is alarming. The cost of treating malaria infection in the world is very high especially in developing countries like Nigeria. The death rate is fast increasing, putting pressure on society. Accurate diagnostic methods are needed to enhance detection of the malaria parasite, treatment and reduce the spread of the malaria infection. This in turn will reduce the rate of anaemia, stillbirth, low birth weight, death absence from normal functioning in the society, wasting human hours. Hence, the comparison of the RDT and microscopy in malaria diagnosis of pregnant women and children attending health facilities in the area. It is for this reason that the present study was designed to compare the sensitivity of RDT and microscopy in malaria diagnosis of pregnant women and children attending health facilities in Yenagoa in Bayelsa State.

Objectives of the Study

The objectives of the study are to:

1. Determine the prevalence of malaria in children and pregnant women attending health facilities in Yenagoa in Bayelsa State.
2. To compare the sensitivity and specificity in children attending health facilities in Yenagoa in Bayelsa State.
3. To compare the sensitivity and specificity in pregnant women attending health facilities in Yenagoa in Bayelsa State.

MATERIALS AND METHODS

The study was conducted at Agudama Health Center in Yenagoa Local Government Area of Bayelsa State. The study site is located within Latitudes 6°37'N to 6°45'N and Longitudes 3°3'E to 3°5'E. Agudama community has a homogeneous population of about 17,000 inhabitants (Census, 2006). The community has a good access road, pipe-borne water and a relatively stable electric power supply. The population in Yenagoa is 319,413 (Census, 2006). It is a semi-arid area and has challenges of acquisition of clean safe water for everybody for domestic uses. The temperature range is between 26°C to 34°C. Occupations of the inhabitants are business fishing, transportation, boat drivers, civil servants, retired civil servants, traders and farmers.

Study Size Sampling

A total of 191 consented patients (40 children and 151 women) within the age range of 15 years and above for pregnant women were sampled out of the population. The study sample size was systematically selected based on the number of pregnant women and children who visited the ante-natal health centre on clinic days.

Ethical Approval

Request and approval to use the hospital for this research were obtained from the Medical Director and the Ethical Committee Bayelsa State. Consent was also obtained from the pregnant women and parents who participated in the study. All work was performed according to the guidelines for human experimentation in clinical research and declaration.

Data and Sample Collection

Questionnaires were designed to collect demographic data, history of drug use, information on gestational age and history of fertile illness. 0.5 ml venous blood sample was collected from the peripheral vein in each participant by a trained laboratory Scientist or technician into EDTA bottles. The bottles were inverted several times to dissolve the anticoagulant and so prevent blood clotting. The leftover blood samples were used to make thick and thin blood films and perform the RDT immediately after the collection.

Preparation of Thick and Thin Blood Films

Slides were labelled with sample number, Patient's Initials and date. The slides were put on a level surface on top of a template to guide the size of the thick smear made and approximate positions of the thick and thin blood films that were made. A drop of blood was placed onto the middle of the slide for the thin blood film and three larger drops about 1 cm from that for the thin film was spotted for the thick film. Using another clean slide as a spreader, the small drop of blood was touched with the spreader and allowed to run along its edge. The spreader was then firmly pushed in one swift stroke along the slide at an angle of 45° making sure it was in even contact with the surface of the slide. Using the corner of the spreader the drops of blood were spread to make an even, a thick film about 1 cm in diameter. The films were allowed to dry for at least 15 min in a flat level position away from dust and protected from flies.

Fixing and Staining of Films

Thin films were fixed by allowing a drop of methanol to run off the thin film away from the thick film for 10-20 seconds, avoiding the fumes of the methanol reaching the thick films. They were placed vertically on racks with the thick film on the upper end away from the base of the drying rack, the methanol running dry away from it. The slides were allowed to air dry until the next day, it was placed in the oven for 15 min at 500°C. Slides were then immersed in 3% Giemsa stain prepared by

diluting Giemsa with buffered water pH 7.2, in troughs, stained for 30 min. The slides were removed from the staining trough and rinsed gently under the running tap and allowed to dry for 15 min before examination under the microscope.

Microscopic Examination of Blood Films and Estimation of Parasitaemia

A drop of immersion oil was dropped on the thick blood film and examined using the 100x oil immersion lenses on a binocular light microscope with 10x ocular objectives so that the total magnification was 1000x. Two hand tally counters were used, one to count parasites and the other to count the WBC in the fields. Before a slide was declared negative, 150-200 high powered fields were read. If parasites are seen, >100/HPF, 2 representative fields were read. If moderate levels are present, then 200 parasites are counted and the number of fields noted. If low levels are present, i.e., <1/HPF, then 200 WBC in the fields were read. On slides with low levels of parasitaemia, a qualified slide reader was consulted to verify immediately that a parasite has been seen. Where they could not agree then the opinion of another qualified reader was sought. The results were reported as the number of parasites per HPF or number of parasites per 200 HPF.

Diagnosing Malaria using a Rapid Diagnostic Test (Strips)

The RDT cassette was opened and removed from the pouch with the other components. 2ml of venous blood was collected from the patients using a tunicate, syringe and needle and transferred into an EDTA bottle and mixed by gently slanting sideways to prevent blood clots. The sample was labelled appropriately. Blood was collected from the EDTA bottle using a tiny Pasteur pipette/ loop provided. A drop of blood collected with the loop was immediately placed in the S (Serum) well of the strip. 3 drops of buffer water were added into the A (Buffer) well and were then allowed to set for 10- 20 minutes and the result was read.

Statistical Analysis

Statistical analyses were carried out and differences in proportion were evaluated using the Chi-square test. Significance for the inferential analytical techniques was set at 0.05 levels ($P < 0.05$).

RESULTS

Out of the 191 patients (40 children and 151 women) examined, 24 pregnant women showed positive for microscopy and 15 women tested positive for RDT with the prevalence of 15.9% and 15.5% respectively. 27 children recorded 67.5% for microscopy and 5 recorded 12.5% for RDT (Table 1).

In children, the sensitivity of RDT was evaluated to be 11.1% and specificity as 84.6%. The Negative Predictive Value (NPV) was 60.0% and the positive predictive value (PPV) was 31.4% (Table 2).

Pregnant women exhibited a sensitivity of 25.0% and specificity of 92.9%. The NPV was 15.3% and PPV was 40.0%. There was a significant difference between microscopy and RDT ($p < 0.000$) (Table 3). The lowest detection was 410 per micro litre. There was detection by RDT at zero level of parasitaemia for 10 cases which showed false-positive and 19 cases of false negative. In pregnant women, the lowest detection limit recorded was 2,200 per micro litre. There was detection by RDT at zero level of parasitaemia for 4 cases of false-positive and 8 cases of false negative.

Table 1: Prevalence of malaria in children and pregnant women

Detection Tech	Children		Pregnant Women	
	No. of negative	No. of Positive	No. of Negative	No. of Positive
Microscopy	13(32.5%)	27(67.5%)	127(84.1%)	24(15.9%)
RDT	35(87.5%)	5(12.5%)	136(90.1%)	15(9.9%)

Key: RDT- RapidDiagnostic Test

Table 2: Sensitivity and specificity in children

Malaria	RDT Grouping		Total
	Negative	Positive	
Negative	11(84.6%)	2(15.4%)	13(32.5%)
Positive	24(88.9%)	3(11.1%)	27(67.5%)
Total	35(87.5%)	5(12.5%)	40(100%)

Sensitivity= 11.1%

Specificity= 84.6%

Negative Predictive Value (NPV) = 60.0%

Positive Predictive Value (PPV) = 31.4%

Table 3: Sensitivity and Specificity in Pregnant Women

Malaria	RDT Grouping		Total
	Negative	Positive	
Negative	118(92.9%)	9(7.1%)	127(84.1%)
Positive	18(75.0%)	6(25.0%)	24(67.5%)
Total	136(90.1%)	15(9.9%)	151(100%)

Sensitivity= 25.0%

Specificity= 92.9%

Negative Predictive Value (NPV) = 15.3%

Positive Predictive Value (PPV) = 40.0%

DISCUSSION

Malaria infection remains the main cause of death both in pregnant women and young children (WHO/UNICEF, 2003). This is due to severe complications such as anaemia and sudden death due to *P. falciparum* (Ashley et al., 2006). Early detection and diagnosis of malaria infection using microscopy could be delayed as a result of lack of electricity, types of equipment, manpower and other reasons. In children, the results of RDT indicated a prevalence rate of 12.5% and 67.5% for microscopy while for pregnant women revealed a prevalence rate of 9.9% for RDT and 15.9% for microscopy respectively. The prevalence observed using both methods was low when compared to previous studies of 82% reported by Ashley et al. (2009) in Oshogo. This compares favourably with Agomo et al. (2009) report, where they recorded 40% among pregnant women in Lagos. This result is higher than studies conducted by Audu and Abdusalam (2015) where they reported a prevalence of 4.8% for pregnant women in Lagos. The spatial variation could be due to environmental and climatic factors which promotes mosquito vectors and preventive measures.

Comparison between microscopy and RDT kit showed 11.1% sensitivity in children and 25.0% in pregnant women while Specificity was 84.6% in children and 92.9% in pregnant women. These results agree with the reports of Audu and Abdusalam (2015) and Moody (2004) who recorded 100% and 98.7% specificity.

This study showed that Microscopy is more effective for the diagnosis of malaria in Nigeria. The prevalence rate observed in pregnant women and children by both methods were 15.9%-67.5%. This is in agreement with research conducted by Olukosi et al. (2018) and Agomo et al. (2009). This study however shows that RDTs are potentially useful tools in the diagnosis of malaria in this setting. The levels of sensitivity of RDTs ranged from 52.9 to 71.0% for *P. falciparum*, however, World Health Organisation (WHO) stated that for RDTs to be a useful diagnostic tool, it must achieve a sensitivity of greater than 95%. This sensitivity obtained did not also meet the criteria for detecting at least 100 parasites per micro litre of blood as stated by Bell (2004). This low sensitivity obtained remains a disadvantage because parasitaemia lower than 100 parasites could still be detected by microscopy. The false-positive result obtained could be attributed to low parasitaemia which might not be detected by RDT (Moody, 2002). A false-negative result could eliminate malaria in an infected patient from treatment and later lead to death (Who, 2000) as well as a false positive result leading to the use of unnecessary treatment for patients not suffering from malaria later leading to drug pressure and resistance.

Conclusion

The results of the comparison between RDT and Microscopy in malaria diagnosis of pregnant women and children attending health centres showed that microscopy remains the gold standard to malaria diagnosis despite the effectiveness of RDT in malaria diagnosis. Hence, every health centres and hospitals use microscopy.

Recommendations

Based on the findings of this study, the researcher makes the following recommendations:

1. The ministry of health should ensure that move sensitive methods of diagnosing malaria parasites be brought in the support microscopy to increase the detection of malaria cases for prompt treatment among the children in the study area.
2. Pregnant women should ensure that they go for early detection of malaria to enhance good treatment of malaria infection to reduce anaemia, low birth weight and stillbirth during child delivery in the study area.

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SERUM ELECTROLYTE CONCENTRATION OF LEAD ACETATE COMPROMISED RATS TREATED WITH AQUEOUS LEAF EXTRACT OF *Moringa oleifera* AND *Cymbopogon citratus*

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Abstract

This study was conducted to determine the effect of the co-administration of aqueous leaf extracts of *Moringa oleifera* and *Cymbopogon citratus* on serum electrolyte levels of Lead acetate exposed female Wistar rats. Thirty adult female Wistar rats were divided into six groups of five per group were used for this study. Group 1 served as normal control and received only water and normal feed *ad libitum*. Lead acetate was administered to groups 2,3,4,5 and 6 daily for 15 days at 150 mg/kg body weight, thereafter, the same dose was administered every other day till the end of the experiment. Groups 3, 4, 5 and 6 were administered with aqueous extracts of *M. oleifera* and *C. citratus* at 1500 mg/kg b.w. at the ratio of 50:50 and combined extract of *M. oleifera* and *C. citratus* at a dose of 3000 mg/kg b.w at the ratio of 50:50 respectively, daily for 56 days. The serum electrolyte levels were assayed at the end of the experiment. A significant increase ($P < 0.05$) in the mean serum sodium and chloride levels was observed in group 6 when compared to the control. The sodium levels in groups 2, 3, 4 and 5 were non-significant ($P > 0.05$) while chloride levels in groups 2 and 3 significantly increased ($P < 0.05$) when compared to group 1. There was no significant difference in Calcium levels in groups 2, 3, 4 and 6 when compared to group 1. Bicarbonate levels revealed a non-significant change ($P > 0.05$) in groups 2, 3, 4, 5 and 6 when compared to control. Conclusively, *Moringa oleifera* and *Cymbopogon citratus* tend to alter serum electrolytes levels at the doses administered.

Keywords: *Moringa oleifera*, *Cymbopogon citratus*, lead acetate, toxicity, electrolytes.

Introduction

Lead (Pb) is one of the many heavy metals known to induce overproduction of reactive oxygen species (ROS) and consequently enhances lipid peroxidation, increase unsaturated fatty acid and decrease the saturated fatty acids of the membranes (Malecka et al., 2001). According to Dutta et al., (2015), oxidative stress plays a significant role in serum mineral or electrolyte alterations in the biological system. Lead (Pb^{2+}) in the body is capable of substituting other bivalent cations like Ca^{2+} , Mg^{2+} , Fe^{2+} and monovalent cations like Na^{+} , by its ionic mechanism, affecting various essential biological processes in the body (Flora et al., 2012; Lidsky & Schnider, 2003).

Moringa oleifera is a horse-radish tropical tree from Africa and India, which has medical and nutritional values and effects (Almatrafi et al., 2017; Leone et al., 2016). *Moringa* leaves are the most utilized part of the plant and contain high nutritional value. The leaves contain antioxidants like flavonoids, polyphenols and ascorbic acid and help prevent the damage and degradation that free radicals cause in the cells of different organs in the body (Verma et al., 2019). Mansour et al., (2020), also reports its amelioratory properties against toxicity.

Cymbopogon citratus is a tropical monocotyledonous hypogeal perennial herb that is

prominent and commonly used in alternative medicine for the treatment of diverse ailments. It is well documented in the literature that the plant contains several bioactive compounds including alkaloids, flavonoids, anthocyanins, anthraquinones, saponins, tannins, phenolic compounds, etc, which give it the efficient potency to scavenge free radicals and other ROS and boost its antioxidation ability (Bastos et al., 2010; Chitra et al., 2012; Oshiobugie et al., 2019).

Herbal combinations are usually used by researchers to explore and develop traditional medicine to obtain additional benefits in the treatment and management of disease (Wediasari et al., 2020). There should be a glance at the biological significance of electrolytes. It is against this background that this study was designed to investigate the effects of combined aqueous extracts of *Moringa oleifera* and *Cymbopogon citratus* on the serum electrolytes of lead acetate-induced toxicity in albino Wistar rats.

Materials and Methods

The leaves of *Moringa oleifera* and *Cymbopogon* were harvested in Ikot Osurua, Ikot Ekpene, Akwa Ibom State. The samples were authenticated by a Taxonomist in the University of Uyo, Uyo. The leaves were then washed and dried under shade, when properly dried; levels were sliced into pieces and spread under shade to further dry them. The dried samples were ground respectively into powder with an electric blender. The powdered leaves samples were macerated and then filtered separately and the filtrate obtained was concentrated via evaporation to dryness in a water bath at 50°C for three consecutive days. The pastes obtained were labelled appropriately and stored in the refrigerator at 4°C for subsequent use.

Thirty (30) female albino Wistar rats obtained from the animal farm facility of the Department of Science Technology in Akwa Ibom State Polytechnic, Ikot Osurua, Ikot Ekpene, were randomly assigned into six groups of 5 rats each in the following format:

- Group 1:** (Normal control) received distilled water and normal feed *ad libitum*.
- Group 2:** (Negative control) received Lead acetate (150 mg/kg b.w) daily for 15 days then every other day for 41 days.
- Group 3:** Were administered Lead acetate (150 mg/kg b.w) for 15 days, then every other day for 41 days along with the aqueous leaf extract of *M. oleifera* (750 mg/kg bw) only.
- Group 4:** Were administered Lead acetate (150 mg/kg bw) for 15 days, then every other day for 41 days along with *C. citratus* extract (750 mg/kg bw) only.
- Group 5:** Were administered 150 mg/kg b.w of Lead acetate for 15 days, then every other day for 41 days alongside combined extracts (750 mg/kg b.w) respectively of *M. oleifera* and *C. citratus* at 50:50 ratio (1500 mg/kg b.w).
- Group 6:** Were administered Lead acetate (150 mg/kg b.w) for 15 days and then every other day for 41 days along with combined extracts (1,500mg/kg b.w respectively) of *M. oleifera* and *C. citratus* at 3000 mg/kg b.w at the ratio of 50:50.

At the end of 50 days, the rats were sacrificed after they had fasted overnight. Blood samples were obtained by cardiac puncture after which they were dissected to reveal the organs. The blood sample of each rat was centrifuged at 3000 rpm for 10 minutes and the separated serum was maintained at 4°C until analyzed.

Serum sodium (Na⁺), potassium (K⁺), calcium (Ca²⁺), chloride (Cl⁻) and bicarbonate (HCO₃) were analyzed using commercially available standard test kits from Randox Laboratories Ltd. (UK) Statistical analysis was carried out using one-way ANOVA by SPSS version 23. Data obtained were expressed as mean+ SEM, and $P < 0.05$ was considered statistically significant.

Table 4.1: Result Showing Serum Electrolytes Concentration of Lead Acetate Compromised Rats Treated with Aqueous Leaf Extract of *Moringa oleifera* and *Cymbopogon citratus*

Groups	Sodium (mmol/L)	Potassium (mmol/L)	Calcium (mmol/L)	Chloride (mmol/L)	Bicarbonate (mmol/L)
1	144.2 ± 1.83	6.82 ± 0.46	2.00 ± 0.09	101.4 ± 0.40	22.3 ± 0.41
2	145.2 ± 0.80	6.78 ± 0.36	2.04 ± 0.10	103.0 ± 0.32	18.9 ± 0.76
3	145.6 ± 0.51	6.88 ± 0.45	2.10 ± 0.05	104.6 ± 0.60	22.3 ± 0.68
4	145.8 ± 0.58	6.60 ± 0.24	2.14 ± 0.02	102.0 ± 0.45	22.2 ± 1.15
5	145.8 ± 2.75	5.80 ± 0.27	1.88 ± 0.09	102.0 ± 0.45	21.4 ± 0.29
6	150.8 ± 2.60	6.58 ± 0.24	2.20 ± 0.08	103.2 ± 0.80	20.0 ± 1.74

Results are expressed as Mean ± SEM

Results

Serum Sodium level showed a non-significant increase ($P > 0.05$) in groups 2, 3, 4 and 5 but a significant increase ($P < 0.05$) was revealed in group 6 when compared to both groups 1 and 2. Furthermore, results also showed a non-significant increase ($P > 0.05$) in serum Calcium levels in groups 2, 3, 4 and 6 when compared to group 1. Group 5 showed a non-significant decrease ($P > 0.05$) when compared to group 1, but there was a significant increase ($P < 0.05$) in groups 4 and 6 when compared to group 5.

Chloride levels showed a significant increase ($P < 0.05$) in groups 2, 3 and 6 but increased non-significantly ($P > 0.05$) in groups 4 and 5 when compared to the control.

Serum Potassium recorded a non-significant decrease ($P > 0.05$) in group 3 but group 5 showed a significant decrease ($P < 0.05$) compared to group 1. Bicarbonate levels revealed a non-significant decrease ($P > 0.05$) in all the groups 2, 4, 5 and 6 when compared to group 1.

Discussion

The kidneys are particularly vulnerable to the effect of toxic agents that can result in renal damage and failure. Many studies reveal a strong correlation between Lead exposure and renal effects (Mission *et al.*, 2010). These further results in elevations of body electrolytes consequent upon nephrotoxicity which is one of the most common kidney problems and is marked when the body is unable to get rid of excess urine and wastes.

This study revealed a non-significant difference in serum Sodium, Potassium, Calcium and Bicarbonate in group 2, administered with lead acetate, this is in line with the research carried out by Amah *et al.*, (2014) who worked on the evaluation of the nephrotoxic effect of lead exposure among automobile repairers in Nnewi metropolis, but contrary to a work carried out by Dobrathowski *et al.*, (2017) who worked on the effect of a short term exposure to lead on the levels of essential metal ions, selected proteins related to them and oxidative stress parameters in human, where they reported a significant ($P < 0.05$) increase in serum calcium. The non-significant difference reported in this study may be due to lower doses of lead exposure (150 mg/kg bw) compared to 1000ppm (1000 mg/kg bw) used by Missoun *et al.*, (2010) who reported a significant increase in calcium levels.

In group 3 (treated with lead acetate + *Moringa oleifera*), there was a non-significant increase in Na^+ , K^+ , and Ca^{2+} but a significant increase in Chloride ion. There was no change in the serum bicarbonate levels when compared to group 1 (control). The significant increase in serum Cl^- is in line with Okwari *et al.*, (2015) who worked on the effect of aqueous leaf extract of *M. oleifera* on some renal function indices in rats, but contrary to Idoko *et al.*, (2018) who worked on effects of experimental

lead exposure and the therapeutic effect of defected *M. oleifera* seed meal on serum electrolyte levels of Wistar rats and reveal non-significant change ($P > 0.05$) in Cl^- along with Na^+ , K^+ and HCO_3^- . In their study, which they used 400 mg/ml lead acetate concentration, which is higher than 150 mg/kg used in this study and could be the reason for the contradiction that is observed in group 3. A non-significant increase ($P > 0.05$) was observed in Ca^{2+} and Cl^- levels while K^+ and HCO_3^- levels decreased non-significantly in group 4 (treated with Lead acetate + *Cymbopogon citratus*). This agrees with a work carried out by Ekpenyong et al., (2014), who worked on *Cymbopogon citratus* extract and observed that it ameliorated atherogenic cardiovascular risk in diabetic induced dyslipidemia in rats.

It also agrees with Alagbe, (2020), who worked on the effect of dietary supplementation of *C. citratus* oil on the haematology and serum biochemical parameters of broiler chicks, where they reported non-significant effects on Na^+ , Cl^- , K^+ and Ca^{2+} levels. In group 5 (lead acetate + *M. oleifera* + *C. citratus*) Na^+ and Cl^- increased non-significantly, Ca^{2+} and HCO_3^- decreased non-significantly while K^+ significantly decreased ($P < 0.05$) as observed. This confirms claims made by Ekpenyong et al., (2014) that at higher doses of *C. citratus* administration the hypokalemia effect observed may be due to the actions of lead that interfere with the generation of negative luminal potential, hence, impair secretion of Potassium. Potassium uptake in extracellular fluid into the cells is vital in normalizing acute risks in the plasma. It has been reported that the migration of potassium from blood to lumen depends on active uptake across the basal cell membrane by sodium ion and potassium ATPase, followed by diffusion of potassium ion into the tubular fluid through the luminal membrane channel of potassium ion. This may be the basis of reduced serum potassium ion in the tubular fluid (Hall et al., 2011) and the reason for the reduced serum K^+ concentrations in groups 2, 4 and 5 extracts of *Moringa oleifera* and *Cymbopogon citratus* is seen to have more effect on serum Potassium at a lower dose. In group 6, both Na^+ and Cl^- significantly ($P < 0.05$) increased. Potassium, Calcium and Bicarbonate had non-significant changes; the combined effect of the extracts was observed on Na^+ and Cl^- significantly at a higher dose. Increased sodium concentration may occur due to excess loss of water relative to sodium loss, decreased water intake or sodium intake or retention of H^+ as well as gastro-intestinal loss (Bishop et al., 2010). The combined extract at a higher dose might have caused these effects, this may require future investigations.

There was a non-significant decrease in HCO_3^- level in group 2 (treated with Lead acetate) compared to the normal control. While, there was a non-significant increase in groups 3, 4, 5 and 6. The decrease in group 2 may be caused by the Lead acetate and the non-significant increases in groups 3 to 6 shows that each of the plant extracts contains bioactive components that are capable of ameliorating the effect of Lead on the bicarbonate level.

It is believed that acid-base imbalance cause changes in HCO_3^- and CO_2 levels. A decreased HCO_3^- level may occur from metabolic acidosis as the HCO_3^- combines with H^+ to produce CO_2 and water, which is exhaled by the lungs. The typical response to metabolic acidosis is compensation by hyperventilation, which lowers the arterial partial pressure of carbon (iv) oxide (pCO_2). Elevated total CO_2 concentrations occur in metabolic alkalosis as bicarbonate is retained, other with increased pCO_2 as a result of compensation by hypoventilation (Bishop et al., 2010).

The serum Ca^{2+} level increased slightly ($P > 0.05$) in group 2 compared to control. Groups 3, 4 and 6 showed a non-significant increase in an ascending order respectively but group 5 (treated with lead acetate and lower dose of combined extract) showed a non-significant decrease when compared with groups 1 and 2. This suggests that the combined extract at a lower dose can reverse the hyperkalemia effect of Lead acetate on the serum Ca^{2+} level. Parathyroid hormone (PTH) in the blood is stimulated by a decrease in ionized Ca^{2+} and conversely, PTH secretion is stopped by a decrease in ionized Ca^{2+} . PTH exerts three major effects on both bone and kidney. In the bone, PTH

activates a process known as bone resorption, in which the osteoblast breaks down and subsequently, Ca^{2+} is released into the extracellular fluid. In the kidneys, PTH conserves calcium by increasing tubular reabsorption of calcium ions. The biologically active form of vitamin D increases Ca^{2+} absorption in the intestine and enhances the effect of PTH on bone reabsorption. Calcitonin, which originates in the medullary cells of the thyroid gland, is secreted when the concentration of calcium ions in blood increases. Calcitonin exerts its Ca^{2+} lowering effects by inhibiting the actions of both PTH and vitamin D (Bishop et al., 2010). It, therefore, implies that the combined leaf extracts of *M. oleifera* and *C. citratus* at a lower dose can minimally stimulate calcitonin and inhibit vitamin D_3 and PTH which resulted in the reduced Ca^{2+} level seen in group 5.

Conclusion

From the results obtained in this study that the combined extracts of *Moringa oleifera* and *Cymbopogon citratus* at lower dose ameliorate the toxic effect of lead which slightly increased the Ca^{2+} and Cl^- levels in the serum but serum for Potassium, the levels shows Lead causes a reduction and the higher dose of the combined extract showed to be more effective in trying to normalize the reduction compared to the lower dose of the combined extract. A lower dose of the combined extract was more effective to remedy the decrease of HCO_3^- levels. Further research should be conducted with a high dose of Lead acetate for a more distinct evaluation.

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SOCIO-DEMOGRAPHIC PREDICTORS OF UTILISATION OF MATERNAL HEALTHCARE SERVICES AMONG WOMEN IN YENAGOA LOCAL GOVERNMENT AREA OF BAYELSA STATE

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Abstract

Studies have shown that there is low level of maternal health care utilization among women of childbearing age. The aim of the study is to investigate the socio-demographic predictors of utilization of maternal health care service among women of child bearing age in Yenagoa local government area of Bayelsa State. A descriptive research design was used for the study. A sample size of 500 was drawn from five hospitals using systematic random sampling technique. The instrument for data collection was structured questionnaire with a 0.91. Data collected were analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. Frequency, percentage, correlation and chi-square statistics were used. The result of the study showed that there was a high relationship between utilization of maternal health care services and socio-demographic variables such as age ($r = 0.82$), educational level ($r = 0.80$), marital status ($r = 0.84$), income ($r = 0.78$) and parity ($r = 0.79$). However, only educational status ($p < 0.05$), marital status ($p < 0.05$) and income ($p < 0.05$) were found to have statistically significant relationship with the utilization of maternal health care services. Thus, it was concluded that the socio-demographic predictors of utilization of maternal health care services among women in Yenegoa are educational status, marital status and income level. It was recommended among others that comprehensive health education on orthodox maternal healthcare practices should be emphasized during antenatal, postnatal visit, in the media and community meetings.

Keywords: socio-demographic predictors, utilization, maternal healthcare, services, women

Introduction

Globally, the health of women from conception up to child rearing has been a major concern and how well they utilize the available maternal services in all levels of maternal health care services goes a long way to save the lives of millions of women of reproductive age. Maternal health is the health of women during pregnancy, childbirth and post-partum (Kifle, Azale, Gelew & Melaw, 2017). Maternal health is a very important issue in that a healthy mother contributes positively to the health of her husband, children and the entire family. However, the utilization of the maternal healthcare services can be influenced by certain demographic factors such as age, marital status, income, parity and level of education.

As regards the utilization of healthcare services, Anum (2015) stated that, education is the single most important factor that will improve utilisation of health care services among women. Education in a way empowers women mentally and economically to make wise decisions about

their health including the utilization of healthcare services rather than self-care. The highly educated childbearing women for example will patronize the best health institution based on their informed minds and perhaps affordability of the service. This is also because the highly educated women are likely to earn more to afford the service cost of the health facilities of their choice. On the other hand, multiparous women who have successfully delivered several babies could think that it is not a big deal to visit the health facilities and then resort to quack in avoidance of health care bills. Conversely, women who have had complications in previous pregnancies may not wait to be cajoled before utilizing maternal health care services due to the negative experience in previous deliveries.

The socio-economic status of women determines their affordability of any health facility. When the socio-economic status of a woman is low and the cost of healthcare services is high, she may not be able to utilize such services. Rasha and Mansoura (2007) viewed socio-economic status as paramount to the choice of healthcare services to be secured because affordability of health care services depends on the socio-economic status of the users. The fees charged for health care often put women off from choosing to utilize health care services. According to Odetola (2015), when services are rendered within the economic power of the consumers of health services, they will be able to access and use the services adequately.

Maternal health care includes medical care provided for women. The Federal Ministry of Health (2010) stated that, the healthcare system is geared towards the provision of general health services of a preventive, curative, promotive and rehabilitative nature to the population. The aim of the health system is mainly health development as process of continuous and progressive improvement of the health status of the population. However the Nigerian health care delivery system is comprehensive and based on Primary Health Care and is centered on promotive, protective, preventive, restorative and rehabilitative to every citizen of the country (Federal Ministry of Health 2010). Over time, maternal health services utilization has been a public health challenge more prominently among the marginalised and vulnerable population sectors Sepehri et al, (2008). Various studies have attributed this to perceived barriers that continuously prevent the marginalised societies to utilize maternal child health services especially in low income countries.

Monitoring maternal and newborn health during the antenatal and postpartum period is critical. Tenkorang (2009) noted that, the risk of death is highest for newborn babies: 75% of all neonatal deaths occur during the first week of life. Timely detection and management of symptoms have been shown to reduce mortality and complications. However, some women may not utilize the health care services available to them due to their demographic features. For instance, a women who gets pregnant out of wed lock and at a very younger age may feel ashamed hence, may not want to register for antenatal early because of the shame whereas, this may go a long way to influence the pregnancy and delivery outcome. Thus, this study investigated the socio-demographic predictors of utilization of maternal health care services in Yenegoa, Bayelsa State.

Research Questions

The study provided answers to the following research questions:

1. What is the relationship between age of respondents and utilization of maternal health care services in Yenegoa Local Government Area of Bayelsa State?
2. What is the relationship between educational status of respondents and utilization of maternal health care services in Yenegoa Local Government Area of Bayelsa State?
3. What is the relationship between marital status of respondents and utilization of maternal health care services in Yenegoa Local Government Area of Bayelsa State?
4. What is the relationship between income of the respondents and utilization of maternal health care services in Yenegoa Local Government Area of Bayelsa State?

5. What is the relationship between parity and utilization of maternal health care services in Yenegoa Local Government Area of Bayelsa State?

Hypothesis: The hypothesis below was postulated to guide the study and was tested at 0.05 alpha level:

H₀: There is no significant relationship between the socio-demographic characteristics of the respondents and utilization of maternal health care services in Yenegoa Local Government Area of Bayelsa State.

Methodology

Research Design: A descriptive survey design was used for this study. According to (Nworgu, 2015) a descriptive survey design is aimed at collecting data and described it accurately and in a systematic manner, the facts, features and characteristics of a population under study. This design is considered appropriate for this study because the researcher collected data from a large sample drawn from a given population under study and described the correlates of maternal service utilization among the sample at a given time without manipulating any independent variables of the study.

Population for the Study: The population of the study consisted of all woman of child bearing age who assessed antenatal, intranasal and postnatal services at five health facilities (hospital) in Yenegoa Local Government Area. There were 188,529 women assessing services in these five healthcare facilities (www.citypopulation).

Sample and Sampling Techniques: A sample size of five hundred (500) was determined using the Taro Yamane formula $n = \frac{N}{1 + Ne^2}$. A multi-stage sampling procedure was used to select the sample size as follows: simple random sampling was used to select five health facilities from the eight major government owned hospitals in Yenegoa Local Government Area, using balloting without replacement. The number of women of childbearing age in each of the facilities was determined using systematic sampling technique to select the respondents.

Instrument for Data Collection: The instrument data collection in this study was a structured questionnaire titled “Predictors of Utilization of Maternal Healthcare Services among Women Questionnaire (PUMHSWAQ)”. The item of the instrument was rated on 4 point Likert scale of Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagreed (SD) weighted as 4, 3, 2, 1 for positive keyed item and reverse for negative keyed item irrespectively.

Validity of Instrument: The face and content validity of the instrument, was determined by giving copies of it to experts in Human Kinetics and Safety Studies for scrutiny, after which the their suggestions and corrections were effected on the questionnaire to get the final copy for data collection.

Reliability: The reliability of the instrument was determined through test-retest method for a measure of consistency of the instrument. Twenty copies of the questionnaire were administered and re-administered to 20 mothers of childbearing age in a nearby area Swali Town which is homogenous to the study area. The first and second scores of the samples were correlated using Pearson Product Moment and a reliability coefficient of the entire instrument was determined and found to be 0.91.

Method of Data Collection: A letter of introduction was given to the researcher by the head of the department and was presented to the five facilities where the data were collected. Informed consent was obtained from the respondents and the purpose of the study explained to the respondents. Copies of the item-questionnaires were administered directly to the respondents by the researcher and research assistants using systematic sampling to identify participants who participated in the study. Guidelines pertaining to the filling of the questionnaire were carefully explained to the respondents and the filled copies of the instrument were collected both on the spot and two weeks after.

Method of Data Analysis: The data collected were entered using the Statistical Package for Social Sciences (SPSS) version 23.0. Statistical tools such as mean, standard deviation and regression were used.

Results: The results of this study are present below in Table 1-6:

Table 1: Relationship between age of respondents and Utilization of Maternal Health Care Services in Yenegoa

Variable	Utilization of Maternal Health Care Service		R-value	Decision
Age of Respondents			.082	*LR
15-20 years	42	9.0%		
21-25 years	71	15.0%		
26-30 years	117	24.8%		
31-35 years	110	23.3%		
36-40years	88	18.6%		
41-49years	44	9.3%		
Total	472	100		

*Low relationship

Table 1 shows the relationship between age of respondents and Utilization of Maternal Health Care Services in Yenegoa. The result shows that more of the respondents who utilized maternal health care services were aged 26-30 years (24.8%) and 31-35 years (23.3%). The result further shows a low positive relationship between age and utilization of maternal health care services among women in Yenegoa ($r = 0.082$).

Table 2: Relationship between educational status of respondents and Utilization of Maternal Health Care Services in Yenegoa

Variable	Utilization of Maternal Health Care Service		R-Values	Decision
Educational status			.80	*VHR
No formal education	21	4.4%		
Primary	52	11.0%		
Secondary	177	37.5%		
Tertiary	222	47.1%		
Total	472	100.0		

*Very High relationship

Table 2 shows the relationship between educational status of respondents and Utilization of Maternal Health Care Services in Yenegoa. The result shows that more of the respondents who utilized maternal health care services were those who had higher educational status such as tertiary education (47.1%) and secondary education (37.5%). The result further shows a very high positive relationship between educational status and utilization of maternal health care services among women in Yenegoa ($r = 0.80$).

Table 3: Relationship between marital status of respondents and Utilization of Maternal Health Care Services in Yenegoa

Variable	Utilization of Maternal Health Care Service		R-Values	Decision
Marital status			.84	*VHR
Single	64	13.6%		
Married	369	78.2%		
Divorced	15	3.2%		
Widow	16	3.4%		
Separated	8	1.6%		
Total	472	100.0		

*Very High relationship

Table 3 shows the relationship between marital status of respondents and Utilization of Maternal Health Care Services in Yenegoa. The result shows that more of the respondents who utilized maternal health care services were the married women (78.2%) The result further shows a very high positive relationship between marital status and utilization of maternal health care services among women in Yenagoa ($r = 0.84$).

Table 4: Relationship between income of respondents and Utilization of Maternal Health Care Services in Yenegoa

Variable	Utilization of Maternal Health Care Service		R-Values	Decision
Income			.78	HR
<N30,000	140	29.7%		
N30,00-50,000	88	18.6%		
N60,000-100,000	163	34.5%		
N 100,000 and above	81	17.2%		
Total	472	100.0		

*High relationship

Table 4 shows the relationship between monthly income of respondents and Utilization of Maternal Health Care Services in Yenegoa. The result shows that more of the respondents who utilized maternal health care services were those who earn N60,000-100,000 monthly (34.5%) The result further shows a high positive relationship between monthly income and utilization of maternal health care services among women in Yenagoa ($r = 0.78$).

Table 5: Relationship between parity of respondents and Utilization of Maternal Health Care Services in Yenegoa

Variable	Utilization of Maternal Health Care Service		R-Values	Decision
Parity (No. of children)			0.79	HR
1-2	196	41.5%		
3-4	158	33.5%		
5 and above	118	25.0%		
Total	427	100		

*High relationship

Table 4 shows the relationship between parity and Utilization of Maternal Health Care Services in Yenegoa. The result shows that more of the respondents who utilized maternal health care services were those who fewer (1-2) children (41.5%). The result further shows a high positive relationship between parity and utilization of maternal health care services among women in Yenagoa ($r=0.79$).

Table 6: Chi-square test showing relationship between socio-demographic characteristics of respondents and Utilization of Maternal Health Care Services

Socio-demographic characteristics	Utilization of maternal health care service		df	X ² -value	P-Value	Decision
Age			5	49.020	0.05	Accepted
15-20 years	42	9.0%				
21-25 years	71	15.0%				
26-30 years	117	24.8%				
31-35 years	110	23.3%				
36-40years	88	18.6%				
41-49years	44	9.3%				
Total	472	100				
Marital status			4	49.399	.000	Rejected
Single	64	13.6%				
Married	369	78.2%				
Divorced	15	3.2%				
Widow	16	3.4%				
Separated	8	1.7%				
Total	472	100.0				
Educational status			3	18.977	.025	Rejected
No formal education	21	4.4%				
Primary	52	11.0%				
Secondary	177	37.5%				
Tertiary	222	47.0%				
Total	472	100.0				
Monthly Income			3	72.597	.000	Rejected
< ₦30,000	140	29.7%				

Table 6 shows the chi-square test of significant relationship between the socio-demographic characteristics of respondents and utilization of maternal health care services. The result showed that there is a significant relationship between utilization of maternal health care services and socio-demographic factors such as marital status (X^2 -value=49.39, $df=4$, $p<0.05$), educational status (X^2 -value=18.97, $df=3$, $p<0.05$), monthly income (X^2 -value=72.59, $df=3$, $p>0.05$). Whereas factors such as age ($p>0.05$) and parity ($p>0.05$) were not statistically significant. Therefore, the null hypothesis was not fully accepted.

Discussion of Findings

The findings of the study shows that there is a significant relationship between demographic profile of respondents and utilization of maternal health care services in Yenegoa Local Government Area of Bayelsa State at $P<0.05$. This could be due to the fact that most of the women were rural dwellers 260 (55.1%) and 212 (44.9%) were urban dwellers hence type of community (X^2 -value = 61.83), $df=1$, $P>0.05$) determines utilization of maternal health care services. It was also discovered that most of the respondents were married (X^2 -value = 49.39, $df=4$, $P<0.05$) and this could have influenced the high rate of relationship between the variables. It can be explained that the respondents had support from their spouses than others who were single 64(13.6%), divorced is (3.3%), widow 16(3.4%) and separated 8 (1.7%).

More than half of the respondents had secondary and tertiary education (X^2 -value = 18.97, $df=3$, $p<0.05$) and this could explain the high relationship between educational attainment and utilization of maternal services because education influences an individual's decision. The present monthly income of respondents (X^2 -value = 72.59, $df=3$, $P<0.05$) was found to have a significant relationship with utilization of maternal services because most of the respondents were civil servants, 183 (38.8%) earning between 60,000 – 100,000 (163, 34.5%) and 100,000 above (81, 17.2%). It was discovered that most of the respondents had one to two child(ren) 196 (41.5%) while 158 (33.5%) had three to four children. This could be a determinant factor that influences their choice of usage. However, 118 (25%) of respondents had five children and above. This may influence their choice positively or negatively especially if in the previous deliveries, they had no complications. The findings of the study is in concordance with the studies carried out by Chamileke (2017), Okonfua, et al (2018), Ukachi (2019), Gupta et al (2013), Tsawe et al (2015), Yang et al (2010), Nuumah et al (2019), Acharya (2016) and Wakama (2003). In their various studies, findings indicated that predictors such as was used in this study were significantly associated or related with the utilization of maternal health care services, at $P<0.05$. However, the findings of Ndie & Idam (2013) is in discordance with the findings of the study which showed that parity had no significant effect ($P>0.05$) on maternal services utilization. This could be due to the fact that the study of Ndie & Idam (2013) had a higher sample size and was carried out in Abakaliki urban compared to this present study that had a lower sample size and was carried out in Yenegoa Local Government Area of Bayelsa State.

Conclusion

Based on the findings of the study, it was concluded that the socio-demographic predictors of utilization of maternal health care services among women in Yenegoa are marital status, income level and educational level.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Comprehensive health education on orthodox maternal healthcare practices should be emphasized during antenatal, postnatal visit, in the media and community meetings.

2. Also government and non-government agencies should subsidize the cost of the maternal health care services to enable the poor access these facilities.
3. Family members and husband should encourage women to utilize the maternal health care services available for them at the different health facilities to avoid complication during and after delivery.

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COMPUTER BASED LEARNING STRATEGIES IN ACQUISITION OF ELECTRICAL MACHINE MAINTENANCE SKILL DURING COVID-19 PANDEMIC IN POLYTECHNICS IN RIVERS STATE

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Abstract

The study determined the computer based learning strategies in acquisition of electrical machine maintenance skill during COVID-19 pandemic in polytechnics in Rivers state. Two research questions guided the study while two null hypotheses formulated were tested at .05 level of significance. The study made use of descriptive survey design and was carried out in Rivers state. The respondents for the study were 47 comprising 37 lecturers and 10 instructors. There was no sampling because of manageable size of the population. A 13-item questionnaire was used as instrument for data collection. The Cronbach Alpha reliability method was used to determine the internal consistency of the questionnaire items and an overall reliability coefficient of .71 was obtained. The data collected were analyzed using mean, standard deviation and t-test statistics to test the null hypotheses at 0.05 probability level of significance. Results revealed that 13 computer based learning strategies were required for acquisition of electrical machine maintenance skill during COVID-19 pandemic in polytechnics in Rivers state. Hence, recommendations include that the findings of the study should be used for acquisition of electrical machine maintenance skill and the school management should organize workshops/seminars for lecturers and instructors on the use of computer based learning strategies in acquisition of electrical machine maintenance skill during COVID-19 pandemic in polytechnics in Rivers state.

Keywords: electrical machine, maintenance, skill, COVID-19 pandemic, polytechnic

INTRODUCTION

Technology is the application of scientific principles to solve practical problems. It is the force that drives the development of nations across the globe. Due to the dynamic nature of technology the societies are gradually giving priority to a learning process that will give rise to mastery of practical skills instead of theories. According to Nugent (2020), practical skill educational programmes are the owners of the future society. One of such programmes is technical and vocational education and training (TVET). Technical and vocational education and training (TVET) is a type of educational training that focuses on practical skills and work-readiness. TVET provides for varied training needs for learners that have different academic and socio-economic background, and prepares them for self-reliant or be gainfully employed, it offers practical instruction that gives learners specific occupational skills (Dike, 2019). The 2004 edition of the NPE in FRN, 2014) section 7, paragraph 40, attempted a more comprehensive definition of technical vocational education and training (TVET) as “those aspects of the educational process which involves, in addition to general education, the study of technologies, related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupation in various sectors of economic and social life.” The 2013 edition of NPE (FRN, 2013) section 3, paragraph 49 refers to “those aspects of the educational process involving, in addition to general education, the study of technologies and

related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life as TVET. FRN, (2013) noted that technical vocational education and training (TVET) is that form of education which is obtainable at the polytechnic.

Polytechnic is a non-university institution where various technological courses and programmes are offered to equip students with knowledge, skills and good attitudes for employment and national development. The programmes of the polytechnics in Nigeria are divided into two categories namely; National Diploma and higher National Diploma programmes. Students who finished national diploma programme or courses are awarded national diploma certificates while those who successfully completed Higher National Diploma Programme are awarded Higher National Diploma Certificates. According to National Board for Technical Education (NBTE) (2002), a polytechnic or college of technology refers to any non-university tertiary institution in Nigeria offering varieties of technological/business diploma programmes at National Diploma, Higher National Diploma and Post Higher National Diploma levels that qualify holders for registration in their professional field. Some of the technological programmes/courses offer by polytechnics or colleges of technology in the country include: mechanical, civil, building and electrical/electronic technology.

Electrical/electronic technology is one of the technological courses in polytechnics where students are expected to acquire knowledge and skills for paid or self-employment after graduation. The Higher National Diploma (HND) programme in Electrical/Electronic Engineering Technology is designed to impart on the students specialized and useable skills in this field of Engineering. The training module of electrical/electronic technology in Polytechnic is divided into three options such, Electronics and Telecommunications, Instrumentation and Control and Electric Power and Machine. Electric Power and Machine programme is designed to produce Higher Technicians in Electrical Engineering for the manufacturing, power generation, transmission, and distribution and utilization industries. On completion, the diplomate should be able to: a. Solve practical problems in electrical engineering by analysis and experimentation; b. Design complex electrical installation, wiring and circuit projects using appropriate connections; c. Erect, assemble and install electrical equipment and system; d. Prepare detailed bills of quantities and specifications related to electrical engineering works. e. install and carry out maintenance on all kind of electrical machines.

Maintenance is the combination of all actions carried out to service, repair or replace a device or system so that it will continue to operate satisfactorily for specified period. It is the actions taken to prevent a device or component from failing or to repair normal equipment degradation experienced with the operation of the device to keep it in proper working order (Igrubia et al, 2021). Maintenance can be viewed as care given to items or equipment to ensure their efficient functioning. According to Tooling University (2012), maintenance is the necessary support and repair of machines which involves tasks as lubricating, adjusting, and replacing of parts. One of the prime objectives in a major maintenance activity is to optimize the output period for carrying out the work. Tooling University further listed types of maintenance to include preventive, predictive, reactive (corrective), reliability centered, condition-based, and autonomous maintenance. However, detailed analysis of the above listed types showed that maintenance be grouped under three headings namely Reactive preventive, predictive and corrective maintenance.

Reactive maintenance, involves responding to equipment malfunctions or breakdowns after they occur in order to restore the asset to normal operating condition. This differs from the proactive maintenance strategy of aiming to anticipate equipment issues ahead of time, and taking steps to prevent them from occurring. Predictive, preventive and reactive, corrective maintenance can only be effectively carried out by skilled personnel.

Skill therefore is defined as the ability to do something well. That is the expertness in the performance of an act. Skill is also an established habit of doing something acquired through repetitive practice (Osinem, 2001). Osinem further added that skills are tied to specific tasks or task domains, and therefore relative. Corroborating the view that skills are tied to specific tasks. Skills are the expertise or capacity to do a job or task, it is the special ability to perform a difficult task quickly and skillfully with hands so that it seems easy. The acquisition of practical skills in the era of covid-19 pandemic required the use of improve teaching strategies.

Corona-virus (COVID-19) outbreak is a pandemic disease that has placed the world in a stand still due its quick wide spread and death rate. It was first discovered in China in December 2019 and as at march 31st 2020 the pandemic has spread to over 202 countries across the land, sea, and air and is still on an increasing rate.

Government of various countries that has been affected by these pandemic with the aid of the World Health Organization (WHO) and other non-governmental volunteers has been battling with strategies and methods to stop the pandemic and its spread. The various strategies which been applied for the time being includes social distancing, self-quarantine, isolation, lockdown and the use of face mask, and hand sanitizer and gloves. These approaches have been accepted globally to curtail the spread of COVID-19 pandemic. Due to the danger associated with physical meetings, the use of computer based learning strategies are necessary during COVID-19 pandemic

Computer based learning strategy is a term that can be used to describe virtually any kind of instruction program using computers as a central staple. This approach to learning takes advantage of the interactive elements of computer software, along with the computer's ability to present different kind of media. The use of computers for learning has generally increased with the advancement of technology (Istifanus, 2017)). The ability of computer hardware to process and present different media types has allowed for more complex computer learning strategies. An example would be a training module that uses videos for lectures.

Computer Assisted Instruction is the use of computer and component electronics in providing learning experiences and self-directed instructions to a learner using tutorial and simulation packages, with little or no assistance from an instructor (Chibuzo, 2012). According to Encyclopedia Britannica (2011), CAI is a programme of instructional material presented by means of computer or computer system. The format can be from a simple programme to teach typing to a complex system that uses the latest technology to teach complex abstract concepts. Computer Assisted Instructions as a programme or instruction or package presented as computer software for instructional purpose. Yusuf and Afolabi (2010) noted that the potential benefits of CAI cannot be underestimated in the contemporary world. According to Spradlin (2012), the use of CAI in classroom instruction has been found to increase learning achievement since students taught with CAI programme perform better than those taught by traditional instruction.

Furthermore Synchronous learning refers to a learning environment that occurs in real-time, with all participants interacting at the same time. It involves the exchange of ideas and information with one or more participants during the same period of time. A face-to-face discussion is an example of synchronous communications. In e-learning environments, examples of synchronous communications include online real-time live teacher instruction and feedback, Skype conversations, or chat rooms or virtual classrooms where everyone is online and working collaboratively at the same time. Lecture is an example of synchronous learning in a face-to-face environment, where learners and teachers are all in the same place at the same time (Ogbonna, 2016). Some examples of synchronous learning environments are having students who are watching a live streaming of a class take part in a chat and having students and instructors participate in a class via a web conference tool such as Blackboard, Collaborate, Adobe Connect, WebEx, Skype among others. These synchronous experiences can be designed to develop and strengthen

instructor-student and student-student relationships, which can be a challenge in distance learning programs. According to Ogbonna (2016), there are two main types of technologies used for synchronous e-learning. These are expensive built systems but may enable the sensation of live real-time interactivity with real people “in the room.” Instructors may add value to their synchronous e-learning in several ways. First, they may plan for synchronous events to make sure that there is high learning value. They may bring in expertise to the classroom that would not exist otherwise. Or they may set up a simulation or role play with sufficient learner preparation for deeper learning value. The main focus of the study is to determine the Computer-based learning strategies in acquisition of electrical engineering skill in era of covid-19 pandemic in Polytechnic Rivers State

The purpose of the study was to determine the Computer-based learning strategies in acquisition of electrical engineering skill in era of COVID-19 pandemic in Polytechnic Rivers State. Specifically the study sought to:

1. Determine the Computer assisted instructional strategies in acquisition of electrical machine maintenance skill in era of covid-19 pandemic in Polytechnic Rivers State
2. Determine the synchronous online learning strategies in acquisition of electrical machine maintenance skill in era of covid-19 pandemic in Polytechnic in Rivers State

Three research questions guided the study:

1. What are the Computer assisted instructional strategies in acquisition of electrical machine maintenance skill in era of covid-19 pandemic in Polytechnic in Rivers State
2. What are the synchronous online learning strategies in acquisition of electrical machine maintenance skill in era of covid-19 pandemic in Polytechnic in Rivers State

The following hypotheses were tested at .05 level of significance

1. There is no significant difference between the mean responses of electrical/electronic lecturers and instructors on the computer assisted instructional strategies in acquisition of electrical machine maintenance skill in era of covid-19 pandemic in Polytechnic in Rivers State
2. There is no significant difference between the mean responses of electrical/electronic lecturers and instructors on the synchronous online learning strategies in acquisition of electrical machine maintenance skill in era of covid-19 pandemic in Polytechnics in Rivers State

METHODOLOGY

This study adopted a descriptive survey research design. According to Gall, Gall and Borg (2007), a survey research is a method of data collection in which questionnaires or interview is utilized in collecting data from a sample that has been selected to represent a population to which the findings of the data analysis can be generalized. The study was carried out in Rivers State. Rivers State has companies and industries that need the graduates of electrical/electronics. More also, the state has technical higher institutions. The population of the study was 47 respondents, comprising 37 electrical/electronic technology lecturers, and 10 instructors of Polytechnic in Rivers State. The entire population was used since the population is of manageable size. Thus purposive sampling technique was used to select only the electrical/electronic technology lecturers, and instructors in Polytechnic in Rivers State.

A structured questionnaire was used to collect data for this study titled “computer based learning strategies in acquisition of electrical machine maintenance skill Questionnaire” (CBLSAMS)'. The instrument contains three sections A-C. Section A elicited information on personal data of the

respondents. Section B Section elicited data on computer assisted instructional strategies in acquisition of electrical machine maintenance skill and Section D elicited data on synchronous online learning strategies in acquisition of electrical machine maintenance skill. The instrument is structured on five point response options of strongly agreed (SA), agreed (A), Undecided (U), Disagreed (D) and Strongly disagreed (SD), with values of 5, 4, 3, 2, and 1 respectively for each one.

The instrument was face-validated by two experts from department of electrical electronics, Rivers state university. To establish the reliability of the instrument, 5 copies of the questionnaires were trial-tested among electrical/electronic lecturers and instructor in Imo state Polytechnic; hence this did not form the part of the main population of the study. On the return of the instrument the Cronbach Alpha reliability coefficient formula was used to determine the reliability of the instrument. This yielded .71 reliability index.

The researcher administered the questionnaire personally together with the help of two research assistants. The researcher informed the research assistance on the procedures required in administering the questionnaire instruments. Forty-four copies of the questionnaire which represent 95.5 percent of the questionnaires were retrieved by the researcher for data analysis. Data collected from the respondents were analysed on five point likert scale using mean and standard deviation to answer the two research questions. T-test statistics was used to test the null hypotheses at .05 probability level of significance. The decision was to accepted an item if mean calculated is greater than or equal to 3.50. On the other hand, reject an item if mean calculated is less than 3.50. The hypotheses were tested at .05 level of significance using t-test and decision made that if the calculated value of t - (tcal) is less than the critical value of t (tcrit), the hypothesis was accepted but if the calculated value of t (t-cal) is greater than or equal to the critical value of t (t-crit), the hypothesis was rejected. The data were analyzed with the aid of Statistical Package for Social Science (SPSS) and Microsoft excels software.

RESULTS

Research Question 1: What are the Computer assisted instructional strategies in acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnic in Rivers State?

Table 2: Mean Response and Standard Deviation on the Computer Assisted Instructional Strategies in Acquisition of Electrical Machine maintenance skill in era of COVID-19 pandemic in Polytechnic

S/NO	COMPUTER ASSISTED INSTRUCTIONAL	LECTURERS			INSTRUCTORS		
		X	SD	REMARK	X	SD	REMARK
1.	Drill and practice strategy	4.23	.846	Agree	4.33	.492	HE
2.	Tutorial strategy	4.19	.480	Agree	4.17	.389	HE
3.	Games strategy	3.59	.802	Agree	4.33	.651	Agree
4.	Simulation strategy	4.30	.654	Agree	4.42	.666	Agree
5.	Discovery strategy	4.44	.655	Agree	4.25	.754	Agree
6.	Problem solving strategy	4.04	.597	Agree	4.00	.739	Agree
	Grand mean	4.211	.1915	Agree	4.250	.2611	Agree

The data in Table 1 revealed that lecturers had a mean range of 3.59 – 4.44 and standard deviation of .480 - .802 while the Instructors had a mean range of 4.00 – 4.42 and standard deviation of .389-.866. The grand mean are 4.211 and 4.250 for lecturers and Instructors respectively which are above the real limit of 3.50. The respondents agreed with all the items in table 1 this indicates that Computer assisted instructional strategies will improve the acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnic in Rivers State. The closeness of the standard deviation indicated that the respondents were homogeneous or closely to their opinion.

Research Question 2: What are the synchronous online learning strategies in acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnic in Rivers State?

Table 2: Mean Response and Standard Deviation of the Synchronous Online Learning Strategies in Acquisition of Electrical Machine Maintenance Skill

S/NO	SYNCHRONOUS ONLINE LEARNING STRATEGIES	TEACHERS			INSTRUCTORS		
		X	SD	REMARK	X	SD	REMERK
1.	Video conferencing strategy	4.30	.778	Agree	4.50	.674	Agree
2.	Web Conferencing strategy	4.19	.854	Agree	4.50	.522	Agree
3.	White boarding strategy	4.35	.719	Agree	4.17	.577	Agree
4.	Audio conferencing strategy	4.02	.517	Agree	4.33	.492	Agree
5.	Chat strategy	4.00	.598	Agree	3.83	.577	Agree
6.	Instant messaging. Strategy	4.11	.646	Agree	4.42	.669	Agree
7.	Email Messages strategy	3.98	.834	Agree	4.08	.793	Agree
Grand mean		4.168	.2836	Agree	4.242	.1832	Agree

The data in Table 2 revealed that lecturers had a mean range of 3.98 -4.35 and standard deviation of .517 - .854, while the Instructors had a mean range of 3.83-4.50 and standard deviation of .425- .798. The grand mean are 4.168 and 4.242 for lecturers and Instructors respectively which are above the real limit of 3.50. The respondents agreed with the all items data in table 2. The respondents agreed with all the items in table 1 this indicates that synchronous online learning strategies will improve the acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnic in Rivers State. The closeness of the standard deviation indicated that the respondents were homogeneous or closely to their opinion.

HO₁: There is no significant difference between the mean responses of electrical/electronic lecturers and students on the computer assisted instructional strategies in acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnic in Rivers State.

Table 3: t-test on the Mean Responses of Computer Assisted Instructional Strategies in Acquisition of Electrical Machine Maintenance Skill in era of COVID-19 Pandemic.

GROUPS	N	MEAN	SD	DF	t-cal	P	Sig	Decision
LECTURERS	35	4.211	.1915	42	-.608	.05	.546	Accepted
INSTRUCTORS	9	4.250	.2611					

Table 3 revealed that the significant value (.546) is greater than the P value (Sig > .05). This indicates that the null hypothesis was accepted. Therefore, there is no significant difference between the mean responses of electrical/electronic lecturers and students on the computer assisted instructional strategies in acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnic in Rivers State.

HO₂: There is no significant difference between the mean responses of electrical/electronic lecturers and students on the synchronous online learning strategies in acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnics in Rivers State

Table 4: t-test on the Mean Responses of Synchronous Online Learning Strategies in Acquisition of Electrical Machine Maintenance Skill in era of COVID-19 pandemic

GROUPS	N	MEAN	SD	DF	t-cal	P	Sig	Decision
LECTURERS	35	4.168	.2836	42	-.855	.05	.396	Accepted
INSTRUCTORS	9	4.242	.1832					

Table 4 revealed that the significant value (.396) is greater than the P value (Sig > .05). This indicates that the null hypothesis was accepted. Therefore, there is no significant difference between the mean responses of electrical/electronic lecturers and students on the synchronous online learning strategies in acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnics in Rivers State.

Discussion of Findings

The data on Table 1 revealed that lecturers had a mean range of 3.59 – 4.44 and standard deviation of .480 - .802 while the Instructors had a mean range of 4.00 – 4.42 and standard deviation of .389-.866. The grand mean are 4.211 and 4.250 for lecturers and Instructors respectively which are above the real limit of 3.50. The respondents agreed with all the items in table 1 this indicates that Computer assisted instructional strategies will improve the acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnic in Rivers State. The closeness of the standard deviation indicated that the respondents were homogeneous or closely to their opinion. While Table 3 revealed that the significant value (.546) is greater than the P value (Sig > .05). This indicates that the null hypothesis was accepted. Therefore, there is no significant difference between the mean responses of electrical/electronic lecturers and students on the computer assisted instructional strategies in acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnic in Rivers State. The findings of this study is in line with Ernest and Ugwuanyi (2016) who described computer assisted instructional technique as holding the promise of carrying the learners along as well as making them active rather than passive participants, stimulating their interest through visual representations that catches their attention to explore especially in the field of sciences. The findings of this study also agree with Yusuf and Afolabi (2010) on effects of computer assisted instruction (CAI) on secondary school students' performance in Biology where the authors found that there is no significant difference existed in the performance of male and female students exposed to CAI in either individual or cooperative settings.

The data in Table 2 revealed that lecturers had a mean range of 3.98 -4.35 and standard deviation of .517 - .854, while the Instructors had a mean range of 3.83-4.50 and standard deviation of .425- .798. The grand mean are 4.168 and 4.242 for lecturers and Instructors respectively which

are above the real limit of 3.50. The respondents agreed with the all items data in table 2. The respondents agreed with all the items in table 1 this indicates that synchronous online learning strategies will improve the acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnic in Rivers State. The closeness of the standard deviation indicated that the respondents were homogeneous or closely to their opinion. While Table 4 revealed that the significant value (.396) is greater than the P value (Sig > .05). This indicates that the null hypothesis was accepted. Therefore, there is no significant difference between the mean responses of electrical/electronic lecturers and students on the synchronous online learning strategies in acquisition of electrical machine maintenance skill in era of COVID-19 pandemic in Polytechnics in Rivers State. This finding is in agreement with Ogbonna (2016), who stated that Synchronous learning environments support learning and teaching and offer students and teachers with multiple ways of interacting, sharing, and the ability to collaborate and ask questions in real-time through synchronous learning technologies.

CONCLUSION

The purpose of this study was to determine computer based learning strategies in acquisition of electrical machine maintenance skill during COVID-19 pandemic in polytechnics in Rivers state. A total of two research questions were examined: one was to ascertain the computer assisted instructional strategies in acquisition of electrical machine maintenance skill in era of COVID-19 pandemic while the second research question was used to determine the synchronous online learning strategies in acquisition of electrical machine maintenance skill in era of COVID-19 pandemic. In order to answer these research questions, 13-item questionnaire was developed and used as the research instrument and was administered to 60 respondents in polytechnics in Rivers state. In conclusion, the respondents agreed that computer based learning strategies are required for acquisition of electrical machine maintenance skill during COVID-19 pandemic in polytechnics in Rivers state.

Recommendations

1. The finding of the study should be adopted by electrical/electronic lecturers in polytechnics
2. Government should provide Computer assisted instructional aids for effective acquisition of electrical/electronic skills in polytechnics.

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ENVIRONMENTALLY-INDUCED DISEASES ON SOCIO-ECONOMIC WELL-BEING OF A RURAL POPULACE IN EMOHUA LOCAL GOVERNMENT AREA IN RIVERS STATE

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Abstract

This study investigated the environmentally-induced diseases on the socio-economic well-being of selected communities in Emohua Local Government Area of Rivers State. It adopted the use of survey research design. Data were collected through the use of questionnaire which was administered in 14 randomly selected communities in the LGA. Two research questions, and one hypothesis guided the study. Mean and simple percentages were used to analyze the research questions, while the hypothesis was analysed with t-test statistic. Investigations revealed that the commonest environmentally-induced diseases in the area include cholera, diarrhea, chicken pox, influenza, measles, hepatitis A and E, foot rot, and vascular wilts. Although the emergence of the diseases may pose some threat on the socio-economic life of the people, statistically speaking, the diseases do not pose any significant effect on the people of the area. Arising from these findings, the researcher concluded by recommending for adequate public enlightenment campaign to educate the people on the importance of good environmental sanitation practices, frequent fumigation of surroundings, establishment of more functional healthcare facilities, among others.

Keywords: environmentally-induced, diseases, socio-economic, well-being

INTRODUCTION

Man's survival is dependent upon the quality of his environment which also defines the quality of what man consumes either as food, air or drug. It is therefore a truism that good health is wealth and wealth is life. Health is a universal human right which attracts social, economic, political, cultural and technological concerns across the globe. The World Health Organization (WHO, 1978) cited in Ukpere and Bruce (2017) defines health as a "state of complete physical, mental, and social well being".

Such an ideal state although is desirable by all concern, is practically limited as a result of environmental imbalances with factors such as poor sanitary conditions and the emergence of environmentally induced diseases posing a serious burden on humanity. In most part of the world especially among developing economies (e.g. Nigeria), there is a regular increase in challenges arising from environmental contamination and pollution.

According to studies conducted by the World Health Organization (WHO, 2016), cited in Ukpere et al. (2017), environmental risk factors apart from causing disabilities, account for high number of deaths globally. Also, epidemiological pre-clinical and interventional clinical studies have shown that environmental stresses are associated with certain health challenges such as disorders, cardiovascular problems, skin diseases and many dysfunctional syndromes (Pascal and

Thompson 2015). It is therefore pertinent to note that the environment is a major determinant on the quality of life of any people. A good environment that is healthy, safe and habitable, support healthy living and longevity. But a dirty and noisy environment can only be appalling, unhygienic, unsafe, and risky for dwelling. Such an environment runs short of basic sanitary condition and cannot support life in the long run (Uziah, 2014).

The environment comprises the air, land, soil and water and all other life supporting materials, resources and living organisms. It is the home of man, hence, it must be in good condition at all time so as to avoid any challenge. However, man's interference on the natural environment has led to many problems including the spread of certain disease causing organisms (bacteria, virus, fungi) and also nematodes. These pathogens thrive very well in a dirty environment (Persson, 2009; Jack, 2010).

It is also pertinent to state here that most of what we eat in this part of the world (especially fruits and vegetable) is from contaminated land or soil as a result of indiscriminate disposal of solid waste (domestic refuse and hospital or clinical wastes) materials such as infested needles, cotton wool, blood samples, sputum from tuberculosis patients, human excreta and industrial effluents. Most annoying is the fact that in some instances, some people use human excrement as fertilizers in an attempt to make their crops grow well. The end result is that we eat those things produced by the crops and get infested by the same crops (Anelo, 2012; Panharamah, 2016).

The inhalation of soil particulate matter and the ingestion of contaminated food can potentially result in serious conditions of which the most common include cancer, including leukemia caused by the contact with soils contaminated with chemicals (for example, gasoline, benzene). Nervous system damage caused especially by the presence of lead (Pb) in soil and affecting especially children. Neuromuscular blockage and depression of the central nervous system, kidney and liver damage caused by chemicals such as mercury (Hg).

Regrettably, majority of the water we drink especially in the rural areas (of which the study area is one) are never safe due to poor sanitary conditions. This has led to the emergence of water-borne diseases. (Persson, 2009; WHO - UNICEF, 2010; UNICEF, 2010; Ukpere, 2014). Among the dreaded water borne diseases which are environmental induced in most rural areas are cholera, malaria, typhoid fever, skin diseases, mental disorders and diarrhea issues. The occurrence of these diseases poses some certain set back on the people. Scholars have carried out researches on environmentally induced diseases in many states of Nigeria but available literatures indicate that none focused on environmentally induced diseases in Emohua Local Government of Rivers State. Hence, this current study is out to x-ray perceived impacts of environmentally induced diseases in Emohua Local Government Area of Rivers State.

Research Questions

1. What are the commonest environmentally-induced diseases in Emohua Local Government Area of Rivers State?
2. Does environmentally induced diseases affect the socio-economic well-being of the residents?

Hypothesis

There is significant relationship between environmentally-induced diseases and the socio-economic well-being of residents in Emohua Local Government Area of Rivers State.

Theoretical Framework

Central Place Theory - (Walter Christaller, 1933)

The issue of social services and how well they are distributed has theoretical basis in the central

place theory proposed by Walter Christaller in 1933. Walter explained that the number, size and distribution of human settlements depend on the concept of "centrality". In reference to him, the degree to which a society serves its 'subjects' is what determines its centrality. Johnson (1970) also lent his voice to the discussion on the concept of central place theory in relation to goods and services on offer at any point in time in the society. According to Johnson the "centrality" of a place in terms of how much goods and services are made accessible to consumers in what really matters. The principles of "central place theory". These are "threshold and range". According to Berry, the threshold requirements are the conditions for entry into the provision of a service or production of goods. The threshold is seen as "the minimum market (price \times quantity) needed to bring it (good or service) into existence and to keep it going". Range represents the maximum distance that must be covered before goods and services can be consumed. Walter therefore refers to this as "economic distance".

In essence, any good only obtained at great cost is likely to be shunned or a viable alternative sought. It is easy to see that "threshold and range" are co-workers, concepts, which threshold represent the minimum demand required to sustain a business while range refers to the needed maximum distance required to sell the products of the business, (Lloyd & Dickens, 1977). From our discussion, it is believed and acceptable that central place theory is fully applicable to regional analysis and also used a framework for planning settlement and sitting facilities. In view of the above, we therefore argue the Walter's central place theory could be usefully applied to the study of locational efficiency of health care facilities and health care service delivery in Emohua Local Government of Rivers State.

METHODOLOGY

The Study Area

Emohua Local Government area was created in 1991, it is made up of fourteen political wards with over 42 communities. It is located between latitudes $4^{\circ} 44'$ and $5^{\circ} 15'$ North and between longitudes $6^{\circ} 0' 5''$ and $6^{\circ} 15'$ East. Its size is approximately 523 sq.km. Its population as at 1991 was 154, 925; 201,901 in 2006 and was projected to be 230,347 in 2010. It shares boundary with Onelga at the north, Imo State at the north-east, Abua/Odual at the south-western axis, Obio/Akpor at the south, Asari-Toru at the extreme south-east, Ahoada-East at the west, Ikwerre at its east.

It is over 90% rural with majority of the people depending on primary production mostly subsistence agriculture and forestry related jobs. It falls within the humid tropics hence it enjoys high rain falls and high temperatures. Its vegetation is tropical rainforest belt. The environmental is not always in good hygienic condition in most part of the year especially during the wet seasons when most surroundings look dirty, thus, encouraging the growth of pathogens.

This study adopted the survey research design in carrying out its investigations. This is based on the fact that the study is a social survey aimed at examining the perceived impacts of environmentally induced diseases on the well-being of the people of the study area. The forty-eight (48) communities of the area constituted the population of the study. These forty-eight (48) communities are located in the 14 political wards of the area. 154,923 (Source: National Population Commission (NPC Census, 1991 & 2006)

This study adopted the use of the simple random sampling technique to randomly select 30% of the 48 communities. Thus, 14 communities were randomly selected from the 14 political wards in the area at one community for each ward. These 14 communities constitute the sample size of the study. Through the use of the Taro Yamene formular, the population of the 14 selected communities was trimmed down to 400 persons. The basic instrument for data collection was 400 copies of well-

structured questionnaire administered to 400 households. Furthermore, the researcher carried out oral interviews and also visited health care facilities in order to gather reliable information on number of recorded cases of the outbreak of those environmentally induced diseases in the area.

Method of Data Analysis

The research questions as posed in the questionnaire were analyzed using descriptive statistics such as simple percentage while the hypotheses were analyzed using suitable statistical tools. Hypotheses one seek to establish a relationship between environmental pollution/poor sanitary conditions and the emergence of environmentally induced diseases in the area, hence, Spearman Rank Order Correlation Coefficient (ρ) was used. Hypotheses two and three seek to establish cause-effect (i.e. impact factor of the effects of the diseases) hence, the students t-test was used. Hypotheses four seek to measure difference in the spread or occurrence of the diseases across the area, hence, chi square (χ^2) was used to analyze the data..

Results

1. What are the commonest environmentally-induced diseases in Emohua Local Government Area of Rivers State?

Common Diseases	SA	A	D	SD
Airborne				
a. Chicken pox	200	124	117	182
b. Influenza	188	198	88	126
c. Measles	317	301	58	47
Waterborne				
d. Cholera	305	187	70	58
e. Diarrhea	314	261	70	45
f. Hepatitis A and E	217	193	90	124
Soil Borne				
g. Foot rot	314	101	170	35
h. Vascular wits	217	193	90	100
i. Verticillum	201	77	160	62
Grand Total	2273	1635	913	779
Percentage	40.59	29.20	16.30	13.91

Out of a total of 400 respondents, 40.59% of them strongly agreed that the above outlined diseases are the commonest in the area, another 29.20% also agreed; while 16.30% disagreed, and 13.91% strongly disagreed. Since there are more agreed responses than disagreed, we hereby conclude that chicken pox, influenza, measles, cholera, diarrhea, hepatitis A and E, foot rot, vascular wilts and verticillum are the commonest environmentally-induced diseases in the area.

2. Does environmentally induced diseases affect the socio-economic well-being of the residents?

S/N	Communities	SA	A	D	SD	Total
1.	Ahia Ogbakiri	194	31	98	77	400
2	Oduoha Ogbakiri	188	10	101	101	400
3.	Isiodu Emohua	205	20	77	98	400
4.	Mgbuitanwo	200	20	93	87	400
5.	Obelle	186	6	107	101	400
6.	Ibaa	105	111	77	107	400
7.	Mgbuohia Ndele	210	11	101	78	400
8.	Imogu Rumuekpe	200	20	81	99	400
9.	Elele Alimini	117	129	67	87	400
10.	Omuosa Omudioga	211	29	68	92	400
11.	Egbeda	201	78	40	81	400
12.	Ubimini	197	24	81	98	400
13.	Mgbu-Omuordu Rumuji	100	126	93	81	400
14.	Rumuodogo Rumuji	196	56	97	51	400
	Grand total	2510	671	1181	1238	5600
	Percentage (%)	44.82	1.98	21.09	22.11	100

Out of a total of 400 respondents, 44.82% strongly agreed that the diseases affect the socio-economic life of the people, another 11.98% agreed; while 21.09% disagreed and another 22.11% strongly disagreed. It is clear from the analysis that the diseases affect the socio-economic lives of the people.

Hypothesis

There is significant relationship between environmentally-induced diseases and the socio-economic well-being of residents in Emohua Local Government Area of Rivers State. This hypothesis seek to address cause-and-effect impact factor hence, the two-sample t-test was implored here on the data in table 4.7. Note also that, both SA and A constitutes data set X_1 while D and SD make-up for data set for X_2 as shown below.

X_1 225, 198, 225, 220, 192, 216, 221, 220, 246, 240, 279, 221, 226, 252

X_2 175, 202, 175, 180, 208, 184, 179, 180, 154, 160, 121, 179, 174, 148

The result of the computation is summarized below.

Table 4.13 Summary of t-computation

n	df	t-cal.	t-critical	Alpha level	P-value	Result	Decision
14	26	0.86	2.056	0.05	0.0000	Not Significant	Ho ₂ Accepted

As presented in table 4.13 above, calculated $t = 0.86$, $df = 26$ hence t -critical is 2.056 under the 0.05 significant level. Since calculated t of 0.86 is lesser than t -critical, we therefore accepted the null hypothesis which stated that the outbreak of environmentally-induced diseases does not cause any significant effect on the socio-economic life of the people of the area; while the research hypothesis (H_a) is hereby rejected.

Discussion

1. The import of research question two/objective two was to ascertain the main environmentally-induced diseases in the area. Investigation revealed that the commonest diseases in the area include airborne diseases (such as chicken pox, influenza and measles), waterborne diseases (such as cholera, diarrhea and hepatitis A and E) and certain soil borne diseases (such as foot rot, vascular witts, and verticillum).
2. Research question three/objective three was targeted at ascertaining whether or not, the outbreak of these diseases affects the socio-economic life of the people of the area . Investigation revealed that the outbreak of the diseases affects the socio-economic life of the people.

Conclusion

Disease burden is a very serious social problem on any people. Diseases do not just occur in space. They are caused by certain agents or pathogens which dwell in the environment. These pathogens and agents can thrive well either in humid or dry environments. Good environmental hygiene is lacking in the study area. Thus, poor sanitary conditions of the various environments are good breeding grounds for the growth of pathogens. The commonest diseases found in the area according to available data from the few health centres include malaria and para-typhoid, measles, cholera, diarrhea, chicken pox, influenza, hepatitis A and E, foot rot, vascular witts and verticillum. They are either airborne, waterborne or soil borne in nature.

Recommendations

Base on the major findings of the study, the research hereby recommend that:

1. Adequate enlightenment campaign should be carried out in the area in order to arouse their level of awareness on the importance of good environmental sanitation practices so as to help sustain a clean, healthy and safe environment.
2. Frequent fumigation exercises should be carried out by both the residents and the local government council authorities. This will help to reduce the population of agents like mosquitoes, flies, pets and insects and pathogens.
3. More functional health centres should be built across the area to reduce the burden of long distant walks and travels.
4. There should be proper monitoring of personnel to ensure that they are carrying out their duties diligently and credibly.
5. Free treatment should be provided especially to the elderly ones and children in the area.
6. Also, potable drinking water should be provided to the people to help reduce cases of waterborne diseases in the area.

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COMMUNICATION AND EMPLOYEE PERFORMANCE IN ORGANIC ORGANIZATIONS

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Abstract

Many organizations today are characterized by rigid bureaucracies with strict rules, well defined procedures, narrowly defined tasks and top-down communication, thereby promoting employee powerlessness, unproductive behaviours and poor organizational performance. This study therefore, examines the correlation between organic organizational structure and organizational performance. This is an analytical study which draws its data from secondary sources such as books, journals and internet. A close look at the model of organic structure reveals that the model is studded with many interesting characteristics which have direct positive correlation with employee's needs satisfaction and positive behaviours in the organization. Anchored on 9,9 (Team Management) of Blake and Mouton's Leadership Grid as the theoretical framework, the study builds on the assumption that high concern for both production and people in the organization has the tendency to foster positive employee's behaviours, maximize efficiency and attain goals. The study concludes that organic structure is fundamental to efficient functioning of an organization because of its flexibility and adaptability in nature. It is recommended, among others that approaches characteristic of organic organizational system be adopted in forward-looking organizations as there is a propensity to foster greater employee's positive behaviours and greater organizational performance and stability.

Keywords: Organic structure, communication, employee performance and task flexibility.

INTRODUCTION

Every organization is concerned with achieving some goals. The achievement of the goals is dependent on the organization's structure which reflects its culture and power relationships. Many organizations are modelled after the mechanistic structure of management where concern is almost entirely with the design and structure of the organization, not with people. Today's world of sophisticated and highly competition business environment cannot endure an organizational structure that creates a barrier to efficient organizational functioning and employee's needs satisfaction. Trethewey (2015) argues that production oriented organizations are highly susceptible to poor or minimal performance, unmotivated and uncommitted workforce if managers maintain an anachronistic organizational structure that promotes individual powerlessness.

In the present day business environment; the structure of the organization must create a suitable work environment in which employees can have access to information wherever it may be located. There must be fluidity of tasks so that an individual can adjust to new situations and organizational needs. The structure must also offer opportunities for employees to share in certain organizational decisions. Moreover, power and authority can be dispersed throughout the organization and employees are empowered to exercise freedom over their work. These distinctive features characterize the organic organizational structure. It is apparent that the core objective of this form of organizational structure is to help create an environment that is rich in employee satisfaction for increased employee and organizational performance. Simpson, Rego and Pina (2020) contend that different studies show that employee satisfaction is one of the strongest

predictors of long-term positive company performance and employee commitment and loyalty. In essence, redesigning the organizational structure to increase employee autonomy and control over their lives, will facilitate increased employee satisfaction and job performance. In turn, the organization will experience more productive employee behaviours and greater organizational performance.

Overview of Organic Structure

The tenet of an organic organization is the creation of an enduring internal environment of an organization in which the employees can contribute their full range of talents to the accomplishment of organizational goals. The world is fast moving from the machine metaphor of the classical organizations. Today's business environment cannot endure an organizational structure that is intolerant of a free flow of information, task flexibility and adaptability to employees' needs. According to McShane and Glinow (2000) organic structure is characterized by:

A wide span of control, low formalization and decentralized decision making. Tasks are fluid, adjusting to new situations and organizational needs. The organic structure values and takes the view that information may be located anywhere in the organization rather than among senior executive. Thus, communication flows in all directions with little concern for formal hierarchy (p.570).

New information and communication technologies, a changing workforce and other factors have strengthened the need for a more organic structure that is flexible and responsive to employee's needs. Trethewey (2015) asserts that organic structures are also more consistent with knowledge management because they emphasize information sharing than hierarchy and status. The concept of organic structure is substantially more relevant today because of the advancement in information and communication technologies and the trend toward empowering employees. Moreover, the concept of authority and maintaining the chain of command are not relevant as employees are now being empowered to make decisions that previously were reserved for management.

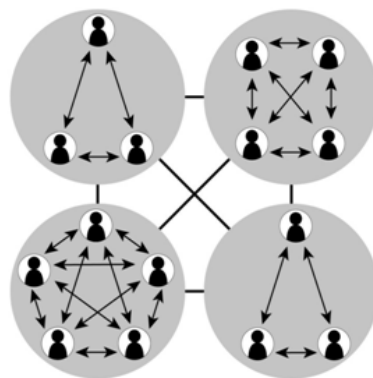


Fig. 1: Blake and Mouton's Leadership Grid

Model of organic structure of Burns, T. and Stalker, G. M (1961) in Robbins, S. P. (2003)

As depicted in Figure 1, organic structure of an organization is based on the perspectives of human resources, McGregor's theory Y and System 4 of Rensis Likert's management theory. Cognizant of the importance of intrinsic needs satisfaction of employees, the model proposes that there should be a cross-functional teams, cross hierarchical teams, free flow of information, wide spans of control, decentralized management and low formalization. The features depict a flatly structured entity with few layers of management, few rules and procedures with vague member responsibilities and duties

in a low degree of formality. Burns and Stalker believe that an organization that takes into consideration the ideas of the employees, opening the doors to teamwork among employees instead of a feeling of competition or a powerlessness, management could provide incentives to employees to cooperate and perform to the best of their abilities.

Theoretical Framework

This study is anchored on 9, 9, (Team Management) of Blake and Mouton's Grid (now called the leadership Grid) propounded in 1964. This leadership Grid as shown in figure 2, concentrates on how a manager can combine the values of the human relations approach to management and the classical management style to maximize the potential of human resources in the organization. According to Miller (2009, p. 40) "team management (9,9 on the Leadership Grid) is characterized by high concern for both production and people, in order to maximize efficiency and attain both individual and organizational goals". Thus, this management orientation allows consensus in decision making. Managers confront and resolve conflict, maintain an atmosphere of trust and acceptance and encourage candid and spontaneous feedback from employees. Such approaches would lead to group accomplishment of task because the leader is concerned with both the task aspects of the job and taking a personal interest in the needs of employees and accepting individual differences among members.

This theory draws its significance from the fact that an organization's structure and the leadership are concomitant in importance. The quality of one is dependent on the quality of the other. As task performance is dependent on the organization's overall leadership style, it is only logical that the leadership approaches which are consistent with organic organizations and the axioms of human relations and human resources, will influence employee behaviour necessary to increase cooperation and productivity.

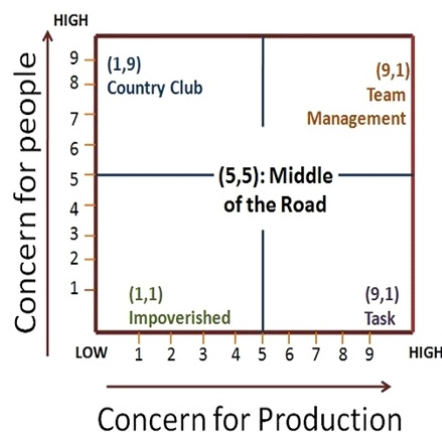


Fig. 2: Blake and Mouton's Leadership Grid

Employee Work-Related Behaviours and Organizational Performance

An organization that wants to maximize its workers' potential and increase its performance, must create a satisfying work environment to achieve that objective. This entails building and sustaining employee's positive work-related behaviours through stringent application of the organic structural characteristics. Mullins (2019) posits that a relatively enduring quality of the internal environment of an organization that is experienced by its members, influences their behaviours towards the organization positively.

In organizations, employees attitudes are important because they affect behaviours. It is incontrovertible that if employees hold a favourable feeling toward the structure of an organization, that attitude may lead to desirable employees behaviours in the organization. Meyer and Hastings (2020) have identified key organizational variables which are important from the standpoint of managerial relevance that potentially influence employee as well as greater organizational performance in flexible organizations. These variables include motivation, job involvement, organizational citizenship behaviour and organizational commitment.

Motivation: According McShane and Glinow (2000, p.66), motivation refers to the forces within a person that affect his or her direction, intensity, and persistence of voluntary behaviour. Robbins (2003) states that people's behaviour in the organization are influenced by what motivates them. Although a number of factors contribute to employee motivation in organic organizations, however, there is consensus among organizational communication scholars that effective communication flow, participative and decentralized management are among the factors that strongly correlate with employee motivation. Eisenberg, Goodall and Trethewey (2010) aver that when employees are satisfied with information and feedback about their tasks, goals, performance and future directions, motivation is likely to occur. Also central to employee motivation is participative management. Jones cited in Udofia (2018) states that employees who are expected to implement organizational decisions should be involved in choosing the course of action because it creates a psychological ownership of the decision. In a similar vein, decentralized management is a highly valued aspect of organic organization because it is potentially more responsive to the local environments in which an organization operates. Robbins (2003, p.431) asserts that in “decentralized organizations, action can be taken more quickly to solve problems, more people can provide input into decisions and employees are less likely to feel alienated from those who make the decisions that affect their work lives”. In both cases, the motivating effect comes from the fact that the organizational processes give the employees a sense of personal worth and importance, particularly, as everyone is given a free hand to develop the future of their decision. Frederick Herzberg in his motivator-hygiene theory cited in Kreitner and Kinicki (2001) assert that satisfaction with the work environment is significantly correlated with motivation. This strong relationship implies that managers can potentially enhance employees' motivation through organic structural approaches.

Job Involvement: Job involvement is “the degree to which an employee identifies with his or her job, actively participates in it, and considers his or her performance important to self-worth”(Cooper and Robertson, 2014, p.86). Fluidity of tasks reflects the character of an organic organization. Employees' positive evaluation of the quality of the internal environment of an organization is likely to lead to job involvement. According to Cross and Carbery (2016) high levels of job involvement have been found to be related to fewer resignation rates. This hypothesis provides a glimpse into the world of organic organizations. Organizational leaders are thus, encouraged to create flexible work environments in order to fuel employees job involvement for high individual and organizational performance.

Organizational Commitment: This refers to the employee's emotional attachment to, identification with and involvement in a particular organization. A production-oriented organization which is characteristic of the mechanistic orientation, cannot produce an enthusiastic and committed workforce. Dorand (2015) opines that an individual can genuinely identify with organizations and be committed to their goals if the organizations are designed to deal with a rapidly changing environment because they possess attributes that make them able to address unforeseen problems, issues and requirements. This statement underscores the importance of organic structure

in creating the environment in which the employees can expend their efforts in the achievement of organizational goals.

As previously noted, participation in organization's decision making, is congruent with organic structure. Organizational commitment is likely to be sustained if employees feel that they are part of the organization when they contribute to decisions that guide the organization's future. Through participation, employees will begin to see how the organization is a reflection of their decisions. From the foregoing, it is evident that a flat fluid structure is necessary to elicit higher levels of commitment. In turn, higher commitment can facilitate loyalty and higher productivity.

Organizational Citizenship Behaviour: This represents “a discretionary behaviour that is not part of employee's formal job requirements, but that nevertheless, promotes the effective functioning of the organization” (Arnold et al., 2010). Every organization is concerned with achieving its set goals. This necessitates the need for employees to do more than their usual job duties. In today's dynamic workplace, organizations need employees to engage in “good citizenship” behaviours. According to Hamed and Zanini (2020, p.348), these behaviours include “making constructive statements about the organization, volunteering for extra job activities, avoiding unnecessary conflicts, showing care for organizational property and respecting the spirit as well as the letter of rules and regulations and punctuality and attendance well beyond standard of enforceable levels”. In organizations where flexibility is critical, these expectations can easily be met. There is no gainsaying that a positive perception of organizational structure can significantly influence employee's willingness to provide performance that is beyond expectations. According to Kreitner and Kinicki (2001), a meta-analysis covering 6,746 people and 28 separate studies revealed a significant correlation between organizational citizenship behaviours and characteristics of the work environment. This relationship is important to recognize because organizational citizenship behaviours can lead to positive work performance.

Conclusion

The theme of this study has been that an organization's internal structure contributes to explaining and predicting employee behaviour. In addition to other factors, the structural relationships in which people work has a bearing on employee attitudes and behaviour. This paper demonstrates that the structure of an organization can constrain employees to the extent that it limits and controls what they do. In this case, organizations structured around high levels of formalization and specialization, strict adherence to the chain of command, limited delegation of authority and narrow spans of control give employees little authority. In contrast, organizations that are structured around limited specialization, low formalization, wide spans of control and effective communication flow can provide employees greater freedom and thus, will be characterized by greater behaviour diversity. This paper also demonstrates that these attributes are found in organic organizations.

It is incontrovertible that organic organizational system is best suited for forward-looking organizations because it is people-oriented. Employees who are satisfied with the structural characteristics of the organization will exhibit diverse positive behaviours that will have a great impact on organizational performance.

Suggestions

From the foregoing, the review suggests that:

- i. Organizations should be structured to allow communication lines to be more fluid and flexible for a better exchange of information between organizational members without a gate-keeper.
- ii. Structuring organizations to reduce overly tight supervision and autonomy should be kept

- on the front burner. This is likely to increase and continually fuel employee's willingness to perform duties based on the specific needs of the organization.
- iii. Organizational structure should be designed encourage dispersal of authority and power throughout the organization to increase responsiveness to local environment.
 - iv. The organizational structural design should be such that endures inputs from all organizational members to enhance their self-worth and importance. This is likely to influence positive employee behaviours and unparalleled job performance.

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HEALTH RISKS ASSESSMENT OF HEAVY METALS IN THREE PROCESSED LOCALLY CONSUMED SPICES FOR PHARMACEUTICAL APPLICATION

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Abstract

In this study, four (4) heavy metals were analyzed (Zn, Cu, Fe, Pb, and Na) using Atomic Absorption Spectrophotometer (AAS) technique. Three (3) food spices namely processed curry powder; processed thyme and processed nutmeg were analyzed for these heavy metals. All the heavy metals analyzed were virtually found in all the spices at varied concentrations (0.135-0.188, 0.041-0.160, 0.311-1.224 and 0.021-0.368, mg/kg for Zn, Cu, Fe, and Pb, respectively) and ranged within the standards of WHO/FAO for metals in food spices. The result indicates that these food spices contain some mineral elements that are essential as nutraceuticals for the body. When these elements/nutrients are far above normal absorbable range, they possess a lot of health risk including questionable disorders. However, Health risk assessment result revealed that no health related issue may arise from its consumption since all the indicators ($EDIM < 1$; $HRI < 1$; $THQ < 1$ and $HI < 1$) were all less than unity. Therefore, the results showed that these spices can be useful in pharmaceutical applications since they contain appropriate amount of the studied heavy metals.

Keywords: health risks, assessment, heavy metals, spices, pharmaceutical application

1.0: INTRODUCTION

1.1: Background to the Study

A spice is a dried seed, fruit, root, bark or flower of a plant or a herb used in small quantities for flavor, color or as a preservative. Many of these substances are also used in traditional medicines. Globalization has made these spices easily available, and increasing their popularity. Spices are said to originate from plants parts such as the trees, seeds, shrubs and grass and are abound in the tropical rain forest and savannah grassland zones. They are dried parts of plants which are used to improve colour, aroma, palatability and most acceptability of food (Mubeen et al., 2009).

Most common spices have been shown to express outstanding microbial, anti-diabetic and anti-oxidants, anti-inflammatory and anti-hypertensive potential (Duraka et al., 2004, Hinne et al., 2006, Srini et al., 2005). In other words, the way spices are been handled in the preparation of food can also make them to be a source of food poisoning (Sherman et al., 1998). Some spices may not contain nutritive components (krejpcio et al., 2007), but their capability of improving taste and appearance of food has made them an important commodity in local Nigerian foods.

Some examples of spices utilized in Nigeria includes: Nutmeg (*Myristica fragrans*), Thyme (*Thymus vulgaris*), Curry leaves (*Murraya Koenigii*), Ginger (*Zingiber officinate*), Guinea plum or amilo (*Parinari excels*), Tumeric (*Curcuma Longa*), Alligator Pepper or grains of paradise (*Aframomum danielli*) Uziza (*Piper guineense*), Cloves (*syzygium aromaticum*). These spices have been studied for their proximate and anti-nutrients in low toxicity levels (Ogunka-Nnoka et al, 2008). Spices are usually referred to as adjuncts due to the fact that they have the capability to stimulate appetite and increase the flow of gastric juice. Domestic spices and herbs in Nigeria are gotten from the wild and little attempt have been made to cultivate and produce them irrespective of the fact that they constitute a higher proportion of the daily diets of rural dwellers.

In as much as spices are used nutritionally in very small quantities, it has been shown by researchers that they can also contribute to the nutrient content of the food. This was confirmed by the studies of Nwinuka et al., (2008) on spices especially on their flavours and aroma, medicinal values, anti-nutrients as well as in drinks, beverages and also in the production of perfumes.

Over the millennia, spices have seen widely used in changing the world's cuisine and medicine (Dukes, 2003). Also, significant quantities of heavy metals have been detected in natural food spices such as pepper and mustard (Krejpcio, 2007; Khan et al., 2014). Although, low level of some heavy metals such as Iron, Manganese, Chromium, Cobalt, Zinc and Copper are very essential even low levels of other metals such as Cadmium and lead can have toxic effects in human biochemical reactions (Jarup, 2003; Cao et al., 2012). If these significant hazardous metals are accumulated, they can breed middle-term or long-term health effects manifestation such as chronic asthma, liver damage, insomnia, depression, kidney damage, and neurological disorders (Mandal & Suzuki, 2002; Barakat, 2011).

Although, spices represent a small fraction of the total food intake, their usage in the preparation of popular daily Nigerian meals such as moi-moi, beans, jollof rice and different kinds of soups, result in the need to evaluate if it's safe for consumption or not. This is because they can be a possible link to transfer contaminants and heavy metals from the environments to humans via food chain since they originate from plants. They are easily contaminated by heavy metals from the soil or aerial depositions due to the fact that they are dried on the ground or on the roof top (Soliman, 2015).

Contaminants and heavy metals can be transferred from the environment to humans via food chain because they are of plant origins. Also, the accumulations of certain heavy metals which are hazardous can lead to middle-term or long term health effects manifesting as depression, insomnia, kidney damage, chronic asthma, liver damage and neurological disorders

However, these heavily consumed spices have not been tested for elemental content to ascertain its health implications. Currently, only few works on this regard have been done. Moreover, the result obtained from this study will indicate the potential health risk associated with the consumption of heavy-metal contaminated vegetable especially in pharmaceuticals and those who consume them as staple food. Furthermore, people need to know the type and source of spices they use in food preparation to ascertain their heavy metal contents. This study will also make known the phytoremediation potential of our indigenous spices. Hence, the need for this study, which can be of benefits to farmers and also serve as a reference material for future researchers. The study therefore, aims to evaluate heavy metal content of three selected spices and the health risks associated with its consumption. And this aim was achieved through the following objectives:

(i) Determination of Zinc (Zn), Copper (Cu), Iron (Fe) and Lead (Pb) contents of three selected spices: processed curry, nutmeg and thyme (ii) Determination of the spices with the lowest and highest metallic content. (iii) Comparison of heavy metal content in the plant with standard. (iv) Determination of health risk associated with the consumption of these spices.

2.0: MATERIALS AND METHODS

2.1: Materials

The materials used for this experiment are processed Curry leaves (*Murraya Keonigii*), Nutmeg (*Mysristica fragrans*), and Thyme (*Thymus vulgaris*)

2.2: Sample Collection

Samples of spices namely: Processed Curry leaves (*Murraya Keonigii*), Nutmeg (*Mysristica fragrans*), and thyme (*Thymus vulgaris*) processed powder sold in different areas of Port Harcourt metropolis, Rivers State, were purchased from Rumuokoro and Igwuruta markets on the 9th and 16th of September, 2020, and kept in a plastic bag and brought to the laboratory of Department of Pharmacy Technician. The source of the curry leaves was authenticated from the seller at the point of purchase to validate they were produced locally in the area. It was transferred into a labeled envelop before sending it to the laboratory for analysis.

2.3: Sample Digestion Method (Patrick-Iwuanyanwu & Chioma, 2017)

A total of 100mL of H₂SO₄, HNO₃, and HClO₄ in the ratio of 40%: 40%: 20% (2:2:1) were mixed. A portion of (2g) of the samples was weighed and digested with a 2mL of the mixed acid to each of the samples in a Kjeldahl flask. The samples were then digested in a fume cupboard with a hot plate until white fumes appeared. After that, the solution was then cooled, filtered and transferred into a 100mL volumetric flask and made up to mark with distilled water

2.4 Method of Heavy Metal Analysis

The samples were analyzed for the presence of Zn, Cu, Fe, and Pb, using. An aliquot was aspirated into the Agilent FS240AA Atomic Absorption Spectrophotometer by APHA 1995 (American Public Health Association) method to determine the amount of residual heavy metals present in the samples. The aspirated aliquot in the flame was atomized when the AAS's light beam is directed through the flame into the monochromator and into the detector that measures the amount of light absorbed by the atomized element in the flame. The amount of energy of the characteristics wavelength absorbed in the flame is proportional to the concentration of the element in the flame.

2.5: Heavy Metal Health Risk Assessment

2.5.1: Calculation of Health Risk Assessment

To assess the possible health risk associated with the consumption of Waterleaf cultivated on soil spiked (contaminated) with sodium arsenate pesticide, the estimated daily intake of arsenic (EDIM), Health Risk Index (HRI) or Hazard Quotient (HQ), Target hazard quotient (THQ) and Target Cancer Risks (TCR) were calculated using the appropriate equations. These parameters do not depend solely on the intake amount of a contaminant, but also on the exposure frequency and duration, average body weight and oral reference dose (RfD).

2.5.2: Estimated Daily Intake of Metal (As)

$$EDIM = \frac{C_{\text{metal}} \times C_{\text{factor}} \times C_{\text{foodintake}}}{B_{\text{average}} \text{ Weight}}$$

equation 2.1 (Chary *et al.*, 2008)

Where, C_{Metal} = the As concentration in spices (mg/kg),

C_{Factor} = the conversion factor,

$C_{\text{Foodintake}}$ = the daily intake of vegetables and

B_{Average} = the average body weight for the adult vegetable consumer.

The conversion factor 0.085 was used to convert fresh vegetable for adult and the average daily intake of vegetable recommended by WHO is between 300 to 350g. But in this study an average of 325g person⁻¹ day⁻¹ is assumed, while the average body weight of an adult vegetable consumer was 60kg for this study (Tsafé et al., 2012).

3.5.3: Health Risks Index (HRI)

The HRI for the consumption of contaminated vegetable (Waterleaf) was estimated as the ratio of the daily intake of metal (As) to the oral reference dose (RfD) for As. The Health Risk Index (HRI) was calculated using the Formula:

$$HRI = \frac{EDIM}{RfD}$$

equation 2.2. (Jan et al., 2010)

Where, EDIM = the estimated daily intake of metals and

RfD = the oral reference dose of metals which is 0.0003 mg/kg /day (EPA, 2002 and IRIS, 2007).

3.5.4: The Target Hazard Quotient

Non-carcinogenic risk estimation of heavy metal (As) was determined using THQ values, which is a ratio of the determined dose of a toxicant to a reference dose considered harmful. THQ is a dimensionless quantity (Harmanescu et al., 2011). THQ values were calculated using the formula:

$$(THQ) = \frac{Efr \times ED \times FiR \times C_{\text{metal}}}{RfD \times WAB \times TA} \times 10^{-3}$$

equation 2.3. Adedokun et al., 2017

Where, Efr = the exposure frequency in 350 days/year,

ED = the exposure duration in 54 years equivalent an average lifetime of the Nigerian population,

FiR = the average daily food intake rate in Kg/person/day (0.325 Kg),

C_{metal} = the concentration of metal in food sample in Mg/Kg,

RfD = the oral reference dose in Mg/Kg/day and

T_A = the average exposure time for non-carcinogen in days ($ED \times 365$ days/year).

2.5.5: Target Cancer Risks

TCR is used to assess the potential risk associated with the exposure to a carcinogenic agent throughout the lifetime exposure period. Here, instead of an oral reference dose, as was used in the determination of THQ, an oral cancer slope factor for inorganic arsenic (CpSo) is used. This factor determines, along with the dose of the carcinogen, the probability of excess cancer risk over the lifetime of the exposed individual. TCR was calculated using the formula:

$$TCR = \frac{Efr \times ED \times FiR \times C_{metal} \times CpSo}{WAB \times TA} \times 10^{-3} \quad \text{equation 2.4. (Joahnn et al., 2017)}$$

3.1: Results

Table 3.1 Lists of Spices Investigated with their Groups and Botanical Names of the Source Plants

Spice Group	Plant	Botanical Name
Seed	Nutmeg	<i>Myristica fragrans</i>
Leaves	Curry	<i>Murraya koenigii</i>
Leaves	Thyme	<i>Thymus vulgaris</i>

Table 3.2: Summary of Heavy Metals Concentrations in Processed Spices

Heavy Metal	Symbol	Curry (Mg/kg)	Thyme (Mg/kg)	Nutmeg (Mg/kg)	Permissible maximum Tolerable Daily Intake (mg/kg)
Copper	Cu	0.073	0.041	0.104	2.0
Iron	Fe	0.494	1.224	0.311	15.0
Lead	Pb	0.129	0.041	0.021	0.21
Zinc	Zn	0.188	0.135	0.140	15.0

Source: Researcher's Laboratory Test, 2021

The result obtained from the analysis showed that the bioaccumulation of heavy metals varied in the processed spices (Table 4.1). In curry powder, it varies between 0.073mg/kg (lowest) and 0.494mg/kg (highest) while in thyme it varies between 0.041mg/kg (lowest) and 1.224mg/kg (highest). Also, in Nutmeg, it varies between 0.021mg/kg (lowest) and 0.311mg/kg (highest). The result further depicted that copper (Cu) and lead (Pb) had the lowest metallic content while iron (Fe) had the highest content across the processed spices (Table 4.1). These values were all lower than the permissible maximum tolerable daily intake of metals prescribed by standard organizations in the world.

Table 3.3: Estimated Daily Intake of Metals from Processed Spices

Heavy Metal	Symbol	Curry (Mg/kg)	Thyme (Mg/kg)	Nutmeg (Mg/kg)	Minimum Risk Level of Oral Intake (MRLOI)
Copper	Cu	3.36×10^{-5}	1.888×10^{-5}	4.788×10^{-5}	0.5 mg/kg (FAO/WHO,2012)
Iron	Fe	2.274×10^{-4}	5.636×10^{-4}	1.432×10^{-4}	15.0 (FAO/WHO,2012)
Lead	Pb	5.939×10^{-5}	1.888×10^{-5}	9.669×10^{-6}	0.02 – 3mg/kg (FAO/WHO,2012)
Zinc	Zn	8.66×10^{-5}	6.216×10^{-5}	6.446×10^{-5}	0.3 – 1mg/kg (FAO/WHO,2012)

Source: Researcher's Laboratory Test, 2021

The estimated daily intake of metal (EDIM) has shown that this value had varied concentrations for all the metals in the processed spices (Table 4.3). It varies from 1.88×10^{-5} to 4.788×10^{-5} ; 1.432×10^{-4} to 5.636×10^{-4} ; 9.699×10^{-6} to 5.939×10^{-5} and 6.216×10^{-5} to 8.66×10^{-5} in Cu, Fe, Pb and Zn respectively across the processed spices. The result further revealed that for Cu, highest EDIM was found in Nutmeg (4.788×10^{-5}), followed by Curry (3.36×10^{-5}) and Thyme (1.888×10^{-5}) as the least. Again, for Fe, highest EDIM was found in Thyme (5.636×10^{-4}), followed by curry (2.274×10^{-4}) and Nutmeg (1.432×10^{-4}) as the least. In Pb, highest EDIM was found in Nutmeg (9.669×10^{-6}), followed by Curry (5.939×10^{-5}) and Thyme (1.888×10^{-5}); and for Zn, highest EDIM was found in Curry (8.66×10^{-5}), followed by Nutmeg (6.446×10^{-5}) and Thyme (6.216×10^{-5}) as the least.

However, all the EDIMs were lower or less than minimum risk level of oral intake of these metals prescribed FAO/WHO (2012), thus indicating that there is no possibility of any health issue of public health interest. This was further supported by the EDIMs that were all less than unity.

Table 3.4: Health Risks Index for Persons Exposed to Heavy metal by Consumption

Heavy Metal	Symbol	Curry (Mg/kg)	Thyme (Mg/kg)	Nutmeg (Mg/kg)
Copper	Cu	4.025×10^{-4}	4.719×10^{-4}	1.197×10^{-3}
Iron	Fe	6.039×10^{-2}	8.051×10^{-2}	2.046×10^{-2}
Lead	Pb	1.697×10^{-2}	5.393×10^{-3}	2.762×10^{-3}
Zinc	Zn	2.885×10^{-4}	2.072×10^{-4}	2.149×10^{-4}

Source: Researcher's Laboratory Test, 2021

The calculated health risks index that is associated with the consumption of these processed spices was computed and presented Table 4.3. The HRI varied between $2.885\text{E-}4$ and $6.039\text{E-}2$, $2.072\text{E-}4$ and $8.051\text{E-}2$, and $2.149\text{E-}4$ and $2.046\text{E-}2$ in curry, thyme and Nutmeg respectively. The result depicted that HRI was in the order: thyme > curry > nutmeg. The HRI from this study was generally lower than unity ($\text{HRI} < 1$) in all the processed spices, which indicates no potential health risks for consumers of any of the studied spices.

Table 3.5: Target Hazard Quotient

Heavy Metal	Symbol	Curry (Mg/kg)	Thyme (Mg/kg)	Nutmeg (Mg/kg)
Copper	Cu	9.479×10^{-6}	5.324×10^{-6}	1.351×10^{-5}
Iron	Fe	3.666×10^{-4}	9.053×10^{-4}	2.308×10^{-5}
Lead	Pb	1.914×10^{-1}	6.085×10^{-2}	3.116×10^{-5}
Zinc	Zn	3.255×10^{-6}	2.318×10^{-6}	2.424×10^{-6}

Source: Researcher's Laboratory Test, 2021

Table 4.5 relates the target hazard quotient (THQ) for adults exposed to heavy metals from consumption of the studied spices. The THQ varied between $3.255\text{E-}6$ and $1.914\text{E-}1$, $2.318\text{E-}6$, and $6.085\text{E-}2$, and $2.424\text{E-}6$ and $3.116\text{E-}5$ for curry, thyme and nutmeg respectively. Furthermore, in this study, all the THQs are far lesser than unity ($\text{THQ} < 1$), therefore, pose no health risks from consumption of these spices.

Table 3.6: Hazard Index of the Metals in the various Spices

Spices	Hazard Index (HI)	Remark
Curry	0.1918	$\text{HI} < 1$
Thyme	0.0620	$\text{HI} < 1$
Nutmeg	0.0001	$\text{HI} < 1$

In order to assess the overall health impact of the bioaccumulated metals in the spices, hazard index was calculated and presented in Table 4.5. The result has shown that the HI varied in concentration from one spices to another. The HIs obtained were 0.1918, 0.0620 and 0.0001 for curry, thyme and nutmeg respectively. It was further revealed that all hazard indexes indicate that there is no possibility of severe health hazard associated with the consumption of these spices.

4.1: Discussion

4.1.1: Levels of Heavy Metals in the Spices

The result obtained from the analysis showed that the bioaccumulation of heavy metals varied in these processed spices. In curry powder, it varies between 0.073mg/kg (lowest) and 0.494mg/kg (highest) while in thyme it varies between 0.041mg/kg (lowest) and 1.224mg/kg (highest). Also, in

Nutmeg, it varies between 0.021mg/kg (lowest) and 0.311mg/kg (highest). The result further depicted that copper (Cu) and lead (Pb) had the lowest metallic content while iron (Fe) had the highest content across the processed spices (Table 4.1). These values were at variance with that obtained by Gaya and Ikechukwu, 2016. They reported heavy metal content of 2.533 (Cu), 12.500(Fe), 3.617(Pb) and 14.0 (Zn) for curry leaves and 9.9 (Cu), 18.0(Fe), 3.80(Pb) and 3.250(Zn) for Nutmeg. These values are very high than our obtained result. However, in this present study, our results are lower than standard: Pb = 0.21; Zn = 15.0; Cu = 2.0 and Fe = 15.0 respectively (Kacholi & Sahu, 2018; FAO, 2013).

Furthermore, the accumulation of heavy metals by these spices group, followed the order thyme > curry > nutmeg. This suggests that thyme has the highest metal content, followed by curry, while nutmeg had the least. This could be attributed to the source and the type of plant or group. For all the spices investigated, none of them exceeded the risks levels set by regulatory agencies.

4.1.2: Health Risk Assessment

Health risk associated with the Consumption of As contaminated Waterleaf *T. triangulare* was done via estimated daily intake of As (EDIM), health risks index (HRI), target hazard quotient (THQ) and hazard index (HI) respectively.

4.1.2.1: Estimated Daily Intake of Metals

In this study, the concentrations of copper, iron, lead and zinc in three processed spices were used to estimate the daily intake of metals via consumption and were observed to be low and lower than unity. However, it was higher in iron (Fe) than copper (Cu), zinc (Zn) and lead (Pb) i.e. Fe > Cu > Zn > Pb respectively. The result revealed that the metal concentration found in the processed spices was generally lower than unity (Table 4.3). Generally, the EDI for all the processed spices studied were very low and lower than the permissible tolerable daily intake of metals: Pb = 0.21; Zn = 15.0; Cu = 2.0 and Fe = 15.0 respectively (Kacholi & Sahu, 2018; FAO, 2013). Thus, implies that consumption of these spices in stew, soup and any other form will not constitute any undesirable health issue since they are lower than the prescribed permissible daily intake.

The low EDIM obtained from this study is in agreement with the previous report of Onianwa et al., (2001) and Shekhar et al., (2001) who independently evaluated heavy metal content of Nigerian foods and accumulation of heavy metals in vegetables grown in sludge amended soils. Further credence was given to their result when Radwan and Salama (2006) estimated the daily intake of heavy metal in Egyptian fruits and discovered that all the EDIMs were very low and lower than unity. A similar result was obtained by Kingsley and Nwachukwu (2017) who evaluated the heavy metal content of vegetables obtained from different markets in Bayelsa state.

4.1.2.2: Health Risks Index (HRI)

Health risks index (HRI) result has shown that all the HRIs were lower than unity ($HRI < 1$) in all the processed spices studied (Table 4.3). This result was at variance with the independent report of Ikeda et al., (2000) and Zhuang et al., (2007) who reported a result with a high $HRI > 1$. This $HRI < 1$ may pose not pose any serious health hazard now or in the future to a population that is practically relies on a spices for cooking food. Moreover, the population will be safe from Cu, Pb, Zn and Fe health risk since it will not cause any severe health risk to the people consuming these spices. The present finding has shown that the use of processed curry leaves, nutmeg and thyme leaves is not a major contributor to heavy metal presence in our food and subsequent uptake by humans.

4.1.2.3: Target Hazard Quotient (THQ)

Furthermore, all the THQ values were less than unity ($THQ < 1$) which indicates a level of no

concern that the population may be at any systemic health risk. This implies that long time exposure to Cu, Pb, Zn, and Fe from these source of spices, may not pose any obvious adverse health effect to the consumer for the period of life expectancy considered. This $THQ < 1$ is in accord with the views of Islam *et al.*, (2014) and Zodape (2014) who argued that THQ should not exceed unity in order not to arouse public health concern. This result was further confirmed by the investigation of Maheshwari & Jasrotia (2015), followed by Adedokun *et al.*, (2016) and Adedokun *et al.*, (2017) who reported a $THQ < 1$ in all the vegetable spices used for their study. However, $THQ > 1$ for heavy metals has been reported by several researchers independently. Singh *et al.*, (2010) reported a higher THQ value ($THQ > 1$) in vegetables from wastewater irrigated area, which was later supported by Cui *et al.*, (2004), Udofia *et al.*, (2016) and Zhou *et al.*, (2016) who also reported $THQ > 1$ in the vegetables they investigated. The report of Ogbo & Patrick-Iwanyanwu (2019) who had $THQ > 1$, gave credence to the earlier reports of previous researchers who had similar THQs.

4.1.2.4: Hazard Index

The HI is the calculation which shows when a population is at risk. From the result in the present study for adults, it was observed that the HI values for all the samples under study were lower than ($HI < 1$) which indicates that there is no potential health risk to those consuming these spices (Table 4.5).

5.2: Conclusion

The results from the present study tends to suggest that consumption of vegetables spices from our local markets under study in Rivers State could not be one of the contributory factors to the heavy metal burden among consumers due to their frequent consumption. Also, the spices could be exploited for their nutraceutical and pharmacological properties since the health risks parameters studied did not indicate any adverse health effect via consumption. Hence, these processed spices portend no serious health issues of public health concern now or in the nearest future and could be useful in pharmaceutical preparations. It could therefore, be inferred that the spices be used in cooking but that studies should be focused on evaluating the un-processed ones to ascertain their safety. Also, these spices should be grown at sites that are not contaminated with heavy metals to avoid possible uptake into the food chain.

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GARCH MODELLING OF COVID-19 PANDEMIC IN SELECTED CITIES IN NIGERIA

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Abstract

This study examined GARCH modelling of covid-19 pandemic in Nigeria. It aimed at building a suitable GARCH Model of Covid-19 Pandemic between the National Weekly Confirmed cases (NWC) in Lagos and Federal Capital Territory (FCT) Abuja. This study used a secondary statistical data extracted from the website of the National Centre for Disease Control (NCDC) on the daily and weekly reported and confirmed cases of Covid-19 pandemic in Nigeria from March 16th, 2020 to May 9th, 2021. The Gretl 18 and Minitab 17 programmes were used to obtain the parameters that constitute the GARCH model, the AIC, BIC, LHC, HQC, R^2 , R^2 -Adjusted, SSE and MSE. The result from the comparison of the two models; GARCH(0,1) of FCT and GARCH(1,0) of Lagos showed that GARCH(1,0) was better, considering the model selection criteria (AIB, BIC, HQC and LKH) and parameter estimates (p-values). This study was able to establish that the Lagos GARCH(1,0) was the best model that describes the data. It was recommended that there should be adequate monitoring in Lagos state to contain the spread of the virus and also, policy makers should put in place a better health care policy favourable to all.

Keywords: GARCH, COVID-19, modelling, pandemic, heteroskedasticity

INTRODUCTION

The infectious disease known as Coronavirus (COVID-19) has ravaged the entire world. The emergence of the disease has weakened the economy of many nations, caused confusion in communities and among the people, kept even the healthy people away from their usual or normal way of life. Many have also died. On the 31st of December, 2019, the Chinese health officials launched an investigation on a potential SARS outbreak and the centre of the outbreak was Wuhan (Hubei province). And about twenty-seven (27) people have been reported infected with the viral pneumonia as at 31st December, 2019. The emergence of the virus was seen as a recurrence of SARS virus outbreak which occurred in 2003 and led to the death of over 700 people across Mainland China and Hong Kong (GARDA WORLD, 2019).

On the 27th day of February, 2020, Nigeria recorded its first case of covid-19. According to Nigeria Center for Diseases Control, an Italian who works in Nigeria returned to Lagos from Milan, Italy on the 25th of February, 2020 already infected.

GARCH (Generalized Autoregressive Conditional Heteroskedasticity) is a statistical model for evaluating time-series data that assumes the variance error is serially autocorrelated. GARCH models assume that the variance of the error term follows an autoregressive moving average process.

1. GARCH is a statistical modeling technique used to help predict the volatility of returns on financial assets.

2. GARCH is appropriate for time series data where the variance of the error term is serially autocorrelated following an autoregressive moving average process.
3. GARCH is useful in assessing risk and expected returns for assets that exhibit clustered periods of volatility in returns.
4. Understanding Generalized Autoregressive Conditional Heteroskedasticity (GARCH)
5. GARCH is a statistical modeling technique used to help predict the volatility of returns on financial assets.

In this study, different GARCH models will be used to model the spread of COVID-19 pandemic in Lagos and Abuja both in Nigeria with the aim of determining the best model that fits the Covid-19 pandemic in Lagos and Abuja, Nigeria.

Problem Statement

The problem to be solved by the research is to determine which area between Lagos and Abuja COVID-19 confirmed cases have more effect on the National Weekly Confirmed cases (NWC) using GARCH Model. That is to show the mathematical effect of Lagos COVID-19 confirmed cases on National Weekly Confirmed cases, and then the effect of Abuja COVID-19 confirmed cases on National Weekly Confirmed cases. The research will determine statistically, the area that affects National weekly confirmed cases more.

Purpose of the Study

This study aimed at building a suitable GARCH Model of COVID-19 Pandemic between the National Weekly Confirmed cases (NWC) on Lagos and Federal Capital Territory (Abuja). It also examines the GARCH models on the spread of the virus in Nigeria and two densely populated areas of the country (Lagos and Abuja). Specifically the objectives of the study are to:

- i. Estimate the descriptive statistics of COVID-19 confirmed cases in Lagos, Abuja and Nigeria as a whole.
- ii. Build a suitable GARCH Model between Lagos and Nigeria National Weekly Confirmed cases for forecasting purpose.
- iii. Similarly, build a suitable GARCH Model between Abuja and Nigeria National Weekly Confirmed cases.
- iv. Compare the analysis of the results, objectives (ii) and (iii) above.

Significance of the Study

The outcome of this study; GARCH Model of COVID-19 Pandemic between the National Weekly Confirmed cases (NWC) on Lagos and Federal Capital Territory (Abuja) would;

- Help Nigeria Centre for Disease Control (NCDC) to understand the spread of the virus.
- Help government in COVID-19 spread control.
- Help government and policy makers on covid-19 measures to put on ground to curtail future spread of disease.
- Serve as a future guide to other researchers that may seek more investigation on this study.

Scope and Limitation of the study

This study is focused on the GARCH Model of Covid-19 Cases Pandemic between the National Weekly Confirmed cases (NWC) on Lagos and Federal Capital Territory (Abuja). It hopes to use the weekly confirmed cases of states with reported laboratory-confirmed covid-19 cases. On the other hand, this present study is limited to the data the researcher extracted from the Nigeria Centre for Disease Control (NCDC) website from 16th March, 2020 to 11th May, 2021.

The data covers the cases recorded in Nigeria and two densely populated areas in the country (Lagos and FCT Abuja) where economic and political activities are prevalent.

LITERATURE REVIEW

Concept of COVID-19

Corona virus disease 2019 (COVID-19) is an ailment caused by a novel corona virus known as severe acute respiratory syndrome corona virus 2 (SARS-CoV-2; formerly known as 2019-nCoV), which was initially detected in Wuhan City, Hubei Province, China, during an outbreak of respiratory sickness cases. On December 31, 2019, it was first reported to the World Health Organization (WHO). The WHO labelled the COVID-19 outbreak a worldwide health emergency on January 30, 2020. COVID-19 was declared a global pandemic by the WHO on March 11, 2020, the first time since H1N1 influenza was proclaimed a pandemic in 2009. SARS-CoV-2-related illness was dubbed COVID-19 by the World Health Organization." To avoid stigmatizing the virus's origins in terms of communities, location, or animal connotations, the name was chosen. The International Committee on Virus Taxonomy of Viruses' Coronavirus Study Group published a statement on February 11, 2020, declaring an official designation for the novel virus: severe acute respiratory syndrome coronavirus 2. (SARS-CoV-2). The Centers for Disease Control and Prevention (CDC) has estimated that SARS-CoV-2 entered the United States in late January or early February 2020, establishing low-level community spread before being noticed. Since then, the United States has been hit by a wave of diseases, with over 33.4 million cases documented and over 600,000 deaths as of June 25, 2021.

To combat the spread of COVID-19, the CDC made a recommendation on April 3, 2020, that the general public, even those without symptoms, begin wearing face coverings in public places where social-distancing measures are difficult to maintain. The following symptoms may indicate COVID-19: Fever or chills, Cough, Shortness of breath or difficulty breathing, Fatigue, Muscle or body aches, Headache, New loss of taste or smell, Sore throat, Congestion or runny nose, Nausea or vomiting and Diarrhea.

Empirical Review

Awan and Aslam (2020) determined the prediction of daily covid-19 cases in European countries using Automatic Autoregressive Integrated Moving Average (ARIMA) model. With the cross-sectional data obtained from the affected countries, an automatic ARIMA model was to predict the number of cases expected in the next ten (10) days.

Abdulmajeed et al. (2020) in their article titled "Online Forecasting of covid-19 cases in Nigeria using limited data", investigated the extent of the spread and effectiveness of containment strategies to stem the transmission of the disease. The combination of Autoregressive Integrated Moving Average (ARIMA) and a Hot-Winters Exponential Smoothing models combined with Generalized Autoregressive Conditional Heteroskedasticity (GARCH) was employed. They concluded that it would be difficult to model covid-19 in the real-life scenario as inherent modeling difficulties, such as the number of tests, randomness and other factors contributed to the forecast model.

Charles et al. (2020) carried out an investigation on Corona virus (covid-19) in Nigeria: Survival Rate. They examined the survival rate of Covid-19 patients in Nigeria using the Autoregressive Integrated Moving Average (ARIMA) forecasting approach. A secondary data obtained from the daily publication/report of the Nigeria Centre for Disease Control (NCDC). They found out that the mean daily survival rate of Covid-19 patients was 27.5% with a median survival rate of 25.4% which is below 50%. Also, the ARIMA (0,1,1) was identified to be appropriate for

predicting the survival rate of covid-19 patients in Nigeria within the period under review.

Musa et al. (2020) investigated a forecast on the Confirmed cases of Covid-19 in selected West African countries using ARIMA model Technique. A secondary data collected from health authorities in West Africa was used for the research. They developed an ARIMA model to forecast future COVID-19 cases in selected West African countries. The result indicated increase in the coming days.

METHODS AND MATERIALS

Research Design: This study design is focused on GARCH Modelling of COVID-19 Cases Pandemic between the National Weekly Confirmed cases (NWC) on Lagos and Federal Capital Territory (Abuja).

Nature and Source of Study Data: The data for this study is a secondary statistical data extracted from the website of the National Centre for Disease Control (NCDC) on the daily confirmed cases of COVID-19 in Nigeria. The daily and weekly reported and confirmed cases from March 16th, 2020 to May 9th, 2021.

Data Analysis Tools: The Gretl programme is used to analyze the parameters that constitute the GARCH model. It was also used to estimate model, then the values of AIC, BIC, LHC, HQC.

Model Specification:

GARCH Model

GARCH model was first developed by Bollerslev (1986). GARCH (1,1) is represented as $R_1 = \mu + \sum_1 (1)$

where $\sum_1 \sim (0, \sigma_i^2)$

$$\sigma_i^2 = \beta_0 + \beta_1 \sum_{i-1}^2 + \beta_2 \sigma_{i-1}^2 \quad (2)$$

where,

μ is the mean

σ_i^2 is the variance of the error at time t

\sum_{i-1}^2 is the squared error at time t-1

$\frac{\omega}{(1-\beta_1-\alpha_1)}$ is the unconditional variance

α_1 is the first (lag 1) ARCH Parameter

β_1 is the (lag 1) GARCH parameter

Estimation of GARCH model:

The well-known GARCH (1,1) model is defined as follows:

$$\sigma_i^2 = \bar{\omega} + \alpha_i \varepsilon_{i-1}^2 + \beta_1 \sigma_{i-1}^2 \quad (3)$$

For α_i^2 to be non-negative, we require the coefficients to be non-negative.

Using the definition $\sigma_i^2 = \varepsilon_i^2 + v_i$, we have,

$$\sigma_i^2 = \bar{\omega} + \alpha_i \varepsilon_{i-1}^2 + \beta_1 \sigma_{i-1}^2$$

$$\varepsilon_i^2 - v_i = \bar{\omega} + \alpha_i \varepsilon_{i-1}^2 + \beta_1 (\varepsilon_{i-1}^2 - v_{i-1})$$

$$\varepsilon_i^2 - v_i = \bar{\omega} + (\alpha_i + \beta_1) \varepsilon_{i-1}^2 + v_i - \beta_1 v_{i-1}$$

Which is an ARIMA(1,1) model for the squared innovation.

Stationarity requires that $\alpha_i + \beta_1 < 1$ generalizes to a GARCH (p,q) model:

$$\sigma_i^2 = \bar{\omega} + \sum_{i=1}^q \alpha_i \varepsilon_{i-1}^2 + \sum_{j=1}^p \beta_j \sigma_{i-1}^2 \quad (4)$$

The GARCH model is equivalent to an infinite ARCH model

Where $\alpha_0 \geq 0$ and $\alpha_i \geq 0$, $i=1, \dots, q$, $\beta_j \geq 0$, $j=1, \dots, p$ is usually the error term in a time series regression model. Therefore, the GARCH model built in the research are GARCH models with independent variable (The state weekly confirmed cases). That is

$$\text{GARCH (1, 1) model: } \sigma_i^2 = \bar{\omega} + \alpha_i \varepsilon_{i-1}^2 + \beta_1 \sigma_{i-1}^2 + \lambda_1 X_i^2 \quad (5)$$

$$\text{GARCH (1, 0) model: } \sigma_i^2 = \bar{\omega}_i + \beta_1 \sigma_{i-1}^2 + \lambda_1 X_i^2 \quad (6)$$

$$\text{GARCH (0, 1) model: } \sigma_i^2 = \bar{\omega} + \alpha_i \varepsilon_{i-1}^2 + \lambda_1 X_i^2 \quad (7)$$

where λ_1 is coefficient of independent variable, X_i^2 is the independent variable and $\bar{\omega}$ is the constant coefficient.

The regression equation can be an autoregressive (AR) process, moving average (MA) process or a combination of AR and MA process (ARMA) depending on the adequacy of the researcher model. For example, suppose we have a return series variable y_t , we can have an AR(1) regression equation as:

$$y_t = \beta_0 + \beta_1 y_{t-1} + e_t \quad (8)$$

Models Selection Criteria

The three most common information criteria for selection models are the Akaike Information Criteria (AIC), Schwarz-Bayesian Information Criteria (BIC), Likelihood Criteria (LHC) and Hannan-Quinn Information Criteria (HQC)

1. Akaike Information Criteria

The AIC is a measure of the relative goodness of fit of a statistical model. The AIC value is given by

$$AIC = T \ln[RSS/T] + 2p \quad (9)$$

where T is the number of data points (observations); \ln is the natural logarithm; RSS is the residual sum of square (σ^2) or the error variance of the model which is an unbiased estimator of the true variance and p is the number of parameters in the model.

2. Schwartz-Bayesian Information Criteria (SBC or BIC)

The SBC or “BIC” is a model selection criterion that involves selections among a finite set of models. The BIC is given by

$$BIC = T \ln[RSS / T] + p \ln(T) \quad (10)$$

3. Hannan-Quinn Criteria (HQC)

The HQC is a model selection criterion that involves selections among a finite set of models. The HQC is given by

$$HQC = T \ln[RSS / T] + p \ln(\ln(T)) \quad (11)$$

RESULTS

1. Descriptive Statistics

The descriptive statistics of the Covid-19 Pandemic in the Nigeria National Weekly Confirmed cases (NNWC); Lagos and Federal Capital Territory (Abuja) COVID-19 Cases.

Table 1: Statistics of Covid-19 Pandemic in Nigeria

Variable	Mean	SE Mean	St.Dev	Minimum	Q1	Median	Q3	Maximum	Skewness	Kurtosis
LAGOS(x)	980	142	1099	57	297	623	1281	4780	2.27	5.01
FCT (w)	335	51.4	398.5	7	71.3	148.5	449	1727	1.76	2.42
NNWC (y)	2792	353	2738	81	976	1703	3956	11179	1.55	1.89

Table 1 shows the mean of the Covid-19 Pandemic in Nigeria, where the expected value is 980 cases for Lagos area, 335 for FCT and 2792 for National Weekly Confirmed cases.

1. Model identification

GARCH Model Identification for FCT Abuja against the Nigeria National Weekly Confirmed Cases

Three GARCH models were built to the COVID 19 pandemic **FCT** against the Nigeria National weekly confirmed cases, which are ARCH(1) or GARCH(0,1), GARCH(1,0) and GARCH(1,1). The summarized results are in Table 2

Table 2: GARCH (p,q) Models Parameter estimate and Selection Criteria values for FCT against the National weekly confirmed cases

Variable	Model	Parameter Estimate (p-values)	Selection Criteria	Remark Suitable Model
FCT(∇w_t)	GARCH(1,1)	$\hat{\mu}=347.413(0.00251^{**})$	AIC=999.2664	GARCH(0,1)
	With constant	$\alpha_0=123014(0.06893^*)$	HQC=1004.182	
		$\alpha_1=0.758674(0.00453^{**})$	LKH=493.6532	
		$\beta_2=0.241326(0.11860)$	BIC=1011.832	
	GARCH(0,1)	$\hat{\mu}=312.973(0.00868^{**})$	AIC=999.7568	
	With constant	$\alpha_0=300765(0.00840^{**})$	HQC=1003.853	
		$\alpha_1=1(0.00430^{**})$	LKH=-494.8784	
			BIC=1010.229	
	GARCH(1,0)	$\hat{\mu}=347.413(0.00251^{**})$	AIC=999.2664	
	With constant	$\alpha_0=123014(0.06893^{**})$	HQC=1004.182	
		$\alpha_1=0.758674(0.00453^{**})$	LKH=-493.6332	
		$\beta_2=0.241326(0.11860)$	BIC=1011.832	

Footnote: ******-Sig. at 5%; *****-Sig. at 10%.

From the Table 2, the identified GARCH model is GARCH(0,1), since all its parameters are significant at 5% and two of its model selection criteria (HAQ=1003.853 and LKH=-494.8784) are better than the other two GARCH models.

GARCH Model Identification for Lagos against the Nigeria National Weekly Confirmed Cases
Similarly, three GARCH models were built to the COVID 19 pandemic LAGOS against the National weekly confirmed cases, which are ARCH(1) or GARCH(0,1), GARCH(1,0) and GARCH(1,1). The summarized results is in Table 3

Table 3:GARCH (p,q) Models Parameter estimate and Selection Criteria values for LAGOS against the National weekly confirmed cases:

Variable	Model	Parameter Estimate (p-values)	Selection Criteria	Remark Suitable Model
FCT(∇w_t)	GARCH(1,1)	$\hat{\mu}=58.0152(0.45922)$	AIC=971.7802	GARCH(1,0)
	With constant	$\alpha_0=77236.5(0.18789)$	HAQ=976.6955	
		$\alpha_1=0.783045(0.03635^{**})$	LKH=-479.8901	
		$\beta_1=0.216955(0.14515)$	BIC=984.3463	
	GARCH(0,1)	—	—	
	GARCH(1,0)	$\hat{\mu}=NILL$	AIC=970.7934	
	Without constant	$\alpha_0=65622.2(0.00001^{**})$	HAQ=974.8894	
		$\alpha_1=0.77876(0.01017^{**})$	LKH=-480.3967	
		$\beta_1=0.22124(0.09431^*)$	BIC=981.2651	

Footnote: ******-Sig. at 5%; *****-Sig. at 10%.

From the Table 3, the identified GARCH model is GARCH(1,0), since all its parameters are significant at 5% and 10% and all its model selection criteria are smaller better than the other GARCH model (GARCH(1,1)).

Comparison of the Identified GARCH Model of the Two Areas

We compared the two identified GARCH models in the two areas to determine the model that has more effect on National weekly confirmed cases in Table 4.

Table 4: GARCH (p,q) Models Parameter estimate and Selection Criteria values between FCT/LAGOS against the National weekly confirmed cases:

Variable	Model	Parameter Estimate (p-values)	Selection Criteria	Remark
FCT(∇w_t)	GARCH(0,1)	$\hat{\mu}=312.973(0.00868^{**})$	AIC=999.7568	
	with constant	$\alpha_0=300765(0.00840^{**})$ $\alpha_1=1(0.00430^{**})$	HQC=1003.853 LKH=-494.8784 BIC=1010.229	
LAGOS(∇x_t)	GARCH(1,0)	$\hat{\mu}=NILL$	AIC=970.7934	GARCH(1,0)
	without constant	$\alpha_0=65622.2(0.00001^{**})$ $\alpha_1=0.77876(0.01017^{**})$ $\beta_1=0.22124(0.09431^*)$	HQC=974.8894 LKH=-480.3967 BIC=981.2651	

Table 4 shows that GARCH model with the highest effects on the Nigeria National weekly confirmed cases is GARCH (1,0) for LAGOS, since all its parameters are significant at 5% and 10% and all its model selection criteria are smaller compared to that of FCT model GARCH (0,1).

Discussion of Findings

The GARCH model on COVID-19 pandemic spread between FCT/Lagos and the National Weekly confirmed pandemic cases were carried out using the statistical softwares Minitab17 and Gretl. Tables 2 to table 4 show the analysis of the GARCH models. However, this study has been able to establish that the Lagos GARCH (1,0) is the best model that describes the data.

Conclusion

GARCH (0,1), GARCH (1,0) and GARCH (1,1) were built separately for both FCT and Lagos to determine which one was best for the weekly reported cases of COVID-19 pandemic in those areas. GARCH (0,1) was identified as the best of the three (3) models built for FCT weekly confirmed cases, while GARCH (1,0) was identified for Lagos weekly pandemic confirmed cases. Comparing the two models; GARCH (0,1) of FCT and GARCH (1,0) of Lagos, considering the model selection criteria (AIB, BIC, HQC and LKH) and parameter estimates (p-values), GARCH (1,0) was found to be better. This implies that the effects of the number of pandemic cases confirmed in Lagos affect the National weekly confirmed cases more.

Recommendations

Based on the result and findings of this study, the researcher recommends that;

1. More elaborate work using large data should be carried out on the trend analysis of COVID-19 pandemic in other densely populated areas in the country to enable the health ministry and the presidential task force on COVID-19 carry out proportional distribution of the insufficient vaccine.
2. There should be adequate monitoring in Lagos state to contain the spread of the virus.

3. Also, policy makers should put in place a better health care policy favorable to all (rich and poor).

Contribution to Knowledge

After a careful research work, the following are the researchers' contributions to knowledge:

1. Identifying that COVID-19 pandemic cases trend both in FCT and Lagos with Nigeria National Weekly Confirmed cases is quadratic.
2. Identifying a suitable GARCH model for COVID-19 Pandemic cases in FCT with Nigeria National Weekly Confirmed cases and Lagos with Nigeria National Weekly Confirmed cases.

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KNOWLEDGE OF COVID-19 INFECTION AND ATTITUDE TOWARDS VACCINATION AMONG HEALTH WORKERS IN SOME SELECTED HEALTH FACILITIES IN YENAGOA, BAYELSA STATE

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Abstract

The sudden outbreak of COVID-19 in Nigeria early in the year 2020, coupled with its morbid and economic implications aroused the need for vaccine production which many thought was too sudden and may not have undergone the trial tests required before vaccines are put out for human consumption. Controversies and stories around the vaccine also increased doubt in many concerning its efficacy. Most health workers have also expressed fear about its effectiveness. This study assessed the knowledge of covid-19 infection and attitude towards vaccination among health workers in some selected health facilities in Yenagoa, Bayelsa State. Four research questions were posed and four hypotheses formulated. The population was 276 health workers. Sample size was 166 being 60% of the population. Design was descriptive; questionnaire was used for data collection with response option of 'True' and 'False' for knowledge items and four point likert scale for attitude items, with reliability index of 0.74 using Pearson's Product Moment Correlation Coefficient. Only 157 questionnaires were correctly filled. Binary logistic regression was used to test the hypotheses. Results obtained revealed that health workers were knowledgeable about COVID-19 infection with those aged 30 – 39 years and 40 -49 years being about 2 times (OR= 2.37, 95% CI:0.24-23.90) and 6 times (OR=5.50, 95% CI:0.31-97.23) respectively, more likely to be knowledgeable of COVID-19 infection than those aged 20 – 29 years. knowledge of covid-19 side effects was high among males (80.4%), negative attitude towards COVID-19 vaccination was high among health workers with male health workers being 1.3 times more likely to possess negative attitude towards COVID-19 vaccination than their female counterpart (OR= 1.33, 95% CI: 0.62-2.90). The study recommends that health workers should endeavor to get vaccinated because they are more exposed due to their occupation, as the vaccine confers a level of protection which is better than not being vaccinated at all.

Keywords: knowledge, attitude, COVID-19, vaccination, health workers

INTRODUCTION

Vaccination is one of the public health measures for prevention of most communicable and non-communicable diseases. This intervention has helped to reduce morbidity and mortality rates among population affected by diseases. In Nigeria diseases such as small pox and poliomyelitis have been completely eradicated with routine vaccination. Others like hepatitis B and C, tuberculosis, tetanus, measles, diphtheria, yellow fever, cervical cancer and others have had their infectibility reduced through vaccination. COVID-19 (also SARS-CoV-2) broke out in late 2019 as an epidemic from a small town known as Wuhan in China and it became a pandemic within few months. In Nigeria outbreak occurred in March 2020 with several deaths even among health care providers recorded. From mid 2021 another COVID-19 variant known as Delta variance which is said to be more deadly than the previous one surfaced. The alarming death toll forced many pharmaceutical companies to embark on research to find a suitable vaccine for the virus since the non-pharmaceutical measures were not sufficient. Range of vaccines were developed and distributed in different countries. For Nigerian the AstraZeneca and Moderna COVID-19 vaccines were accepted. Many conspiracy theories were developed which created doubt in the minds of many Nigerians as to the efficacy of the vaccine especially since it was rapidly developed.

Studies in the past have it that a vaccine took many years to be developed and it has to go through several random clinical trials to measure its effectiveness and efficacy. The front line health workers were the first to be vaccinated due to their level of exposure to infected cases. Some are yet to be vaccinated. Many who took the vaccine did so because their employers threatened to sack them; others took because they had no choice since they were already exposed. Still, many declined but preferred rather to continue with the non-pharmaceutical measures. The doubts further increased when people who took the vaccine became infected or died.

According to findings by Saiful et al. (2021), a global survey of potential COVID-19 vaccine acceptance shows that 48% of their study population were confused about the COVID-19 vaccinations and remained unsure about whether they would have the vaccination. Similarly, a Chinese study as cited by Saiful et al. (2021) found that only just over half of their participants (54%) said that they intended to have the vaccination. This relatively low proportion of people willing to have the vaccine is worrisome, since although the most effective measure of controlling the spread of the virus is to protect oneself from being exposed to COVID-19.

Attitude is an individual's disposition to react with a certain degree of favorableness to an object, behaviour, person, institution or event (Dagmar & Peter (Eds) (1993) and it is expressed by ones mental state, feeling and predisposition (Altmann, 2008). It is a psychological construct, a mental and emotional entity that characterizes a person. They are complex and acquired through experiences. Thus one's experience towards a thing or event influences his attitude whether negative or positive. Corroborating with the above assertion Pierreet et al (2021), maintained that past experience with pandemic influenza vaccination suggests that not all Health Workers will agree to be vaccinated against COVID-19.

It is often mistakenly believed that Health Care Workers' attitudes must be positive towards vaccines because they have scientific knowledge and medical training. Nzaji (2020) asserts that health care workers attitudes toward COVID-19 vaccines are important determinant of their own vaccine uptake and the likelihood of recommending the vaccine to others. Nevertheless, Health Care Workers (HCWs) are not a homogenous group and most are not experts in the field of vaccination. The perception that vaccines developed in an emergency cannot be guaranteed safe, appeared to play an important role on acceptance of COVID-19 vaccines.

Statement of the Problem

In order to halt the ongoing pandemic, the COVID-19 vaccine has been framed as the ideal solution. Substantial numbers of vaccines are being developed and several clinical trials have recently been

released with positive results, leading to a number of countries approving specific vaccines. Nigeria not been left out has approved AstraZeneca vaccine and recently the Moderna vaccine for use but based on observation, there is growing concern that most health workers are not comfortable with the vaccines, owing to controversies and stories surrounding the COVID-19 pandemic and its Vaccines. A close observation of health workers response to the idea of been vaccinated tend to frighten them owing to unknown outcomes. These observations as made around health workers in Yenagoa, Bayelsa State are the reason for this study. Therefore it has become pertinent at this moment to obtain facts on the Knowledge of COVID-19 infection and attitude towards vaccination among health workers in some selected health facilities in Yenagoa, Bayelsa State.

Aim and Objectives of the Study

This study is aimed at assessing the knowledge of COVID-19 infection and attitude towards vaccination among health workers in some selected health facilities in Yenagoa, Bayelsa State.

Specific objectives are:

1. Examine the extent of knowledge of COVID-19 Infection among health workers in some selected health facilities in Yenagoa, Bayelsa State based on age.
2. Assess the extent of knowledge of COVID-19 vaccine action among health workers in some selected health facilities in Yenagoa, Bayelsa State based on age.
3. Evaluate the extent of knowledge of COVID-19 vaccine side effects among health workers in some selected health facilities in Yenagoa, Bayelsa State based on gender.
4. Determine the attitude towards COVID-19 vaccination among health workers in some selected health facilities in Yenagoa, Bayelsa State based on gender.

Research questions

1. To what to extent is the knowledge of COVID-19 Infection among health workers in some selected health facilities in Yenagoa, Bayelsa State based on age?
2. To what extent is the knowledge of COVID-19 vaccine action among health workers in some selected health facilities in Yenagoa, Bayelsa State, based on age?
3. To what extent is the knowledge of COVID-19 vaccine side effects among health workers in some selected health facilities in Yenagoa, Bayelsa State based on gender?
4. What is the attitude towards COVID-19 vaccination among health workers in some selected health facilities in Yenagoa, Bayelsa State based on gender?

Hypotheses

1. There is no significant relationship between knowledge of COVID-19 Infection among health workers in some selected health facilities in Yenagoa, Bayelsa State based on age.
2. There is no significant relationship between knowledge of COVID-19 vaccine action among health workers in some selected health facilities in Yenagoa, Bayelsa State based on age.
3. There is no significant relationship between knowledge of COVID-19 vaccine side effects among health workers in some selected health facilities in Yenagoa, Bayelsa State based on gender.
4. There is no significant relationship between knowledge and attitude towards COVID-19 infection and vaccination among health workers in some selected health facilities in Yenagoa, Bayelsa State based on gender.

Methodology

The design for the study was descriptive. Population of this study comprised 276 health workers in three selected health facilities in Yenagoa, Bayelsa State namely NDUTH Okolobiri with a

population of 161, Diete Koki Memorial Hospital 95 and Agudama Primary Health Center which had 20 health workers. 60% of the population being 166 health workers was obtained as sample size, the convenience sampling technique was adopted. Instrument for data collection was a structured questionnaire, which had two sections; section A had respondents' bio-data while section B contained items to answer the research questions and test hypotheses. It had a total of 20 items with True or False response options for items eliciting response on knowledge and four point Likert scale of strongly agree (SA), agree (A), Disagree (D), and strongly disagree (SD) and with weights of 4, 3, 2 and 1 point respectively to elicit response on attitude. The instrument was validated accordingly and reliability test was carried out using the split half method. Pearson Product Moment Correlation Coefficient was used to analyse the data and a reliability index of 0.74 was obtained. The questionnaire was administered directly by the researcher within three weeks. Out of 166 copies of the questionnaire, only 157 were returned and correctly completed. Hence analysis was based on 157 respondents. Data was analysed using percentage and Binary logistic regression.

RESULTS (N = 157)

Section A: Biodata

Data obtained showed that 50.0% of the respondents were aged between 20 - 29 years, 30.4% were between 30 -39 years, 13.9% were 40 - 49 years and those aged 50 -59 years were 5.7%. 64.5% were females and 35.4% were males. 40.5% were Nurses, 14.5% Doctors, 15.8% Laboratory scientists, 13.9% Pharmacists, 8.9% Community Health Officers, 3.8% Record Officers, 1.3 Environmental health Officers, 0.6% Dentists, and 0.6% were other health professionals not mentioned here.

Section B: Answering the Research Questions

R/Q 1: Extent of knowledge of COVID-19 Infection among health workers based on age.

Table 1: knowledge of COVID 19 infection and age of health workers

			knowledge		Total
			less knowledgeable	knowledgeable	
How old are you	20-29	Count	10	70	80
		% within how old are you	12.5%	87.5%	100.0%
		% of Total	6.4%	44.6%	51.0%
	30-39	Count	3	42	45
		% within how old are you	6.7%	93.3%	100.0%
		% of Total	1.9%	26.8%	28.7%
	40-49	Count	2	21	23
		% within how old are you	8.7%	91.3%	100.0%
		% of Total	1.3%	13.4%	14.6%
	50-59	Count	1	8	9
		% within how old are you	11.1%	88.9%	100.0%
		% of Total	0.6%	5.1%	5.7%
Total	Count		16	141	157
	% within how old are you		10.2%	89.8%	100.0%
	% of Total		10.2%	89.8%	100.0%

Table 1 above revealed the knowledge of COVID19 infection based on age. The result indicated that knowledge was high. As 95.0%, 97.8%, 100% of the respondents aged 20-29years, 30-39years and 40-49years respectively were knowledgeable of COVID 19 infection.

R/Q 2: Extent is the knowledge of COVID-19 vaccine action among health workers based on age.

Table 2: knowledge of COVID 19 vaccine action based on age of health workers

			kcvaccination123 less knowledgeable		knowledgeable	Total
How old are you	20-29	Count	22	58	80	
		% within how old are you	27.5%	72.5%	100.0%	
		% of Total	14.0%	36.9%	51.0%	
	30-39	Count	12	33	45	
		% within how old are you	26.7%	73.3%	100.0%	
		% of Total	7.6%	21.0%	28.7%	
	40-49	Count	7	16	23	
		% within how old are you	30.4%	69.6%	100.0%	
		% of Total	4.5%	10.2%	14.6%	
	50-59	Count	1	8	9	
		% within how old are you	11.1%	88.9%	100.0%	
		% of Total	0.6%	5.1%	5.7%	
Total	Count		42	115	157	
	% within how old are you		26.8%	73.2%	100.0%	
	% of Total		26.8%	73.2%	100.0%	

Table 2 above revealed the knowledge of COVID-19 vaccine action among health workers in Yenegoa based on age. The result indicated that knowledge of COVID-19 vaccine action was high (72.5%, 73.3%, and 88.9%) among respondents aged 20-29years, 30-39years and 50-49years respectively. However, knowledge was moderate (69.6%) among respondents age 40-49years.

			kvaccinationside123 less knowledgeable		knowledgeable	Total
sex	female	Count	33	68	101	
		% within sex	32.7%	67.3%	100.0%	
		% of Total	21.0%	43.3%	64.3%	
	male	Count	11	45	56	
		% within sex	19.6%	80.4%	100.0%	
		% of Total	7.0%	28.7%	35.7%	
Total	Count		44	113	157	
	% within sex		28.0%	72.0%	100.0%	
	% of Total		28.0%	72.0%	100.0%	

Table 3 above showed the knowledge of COVID 19 vaccine side effects based on gender. The results indicated that knowledge of COVID 19 vaccine side effects was high among male (80.4%) and moderate among female health workers (67.3%).

R/Q 4: Attitude towards COVID-19 vaccination among health workers based on gender
Table 4: Attitude towards COVID 19 vaccination among health workers based on gender.

			Attitude		
			negative attitude	Positive attitude	Total
sex	female	Count	74	27	101
		% within sex	73.3%	26.7%	100.0%
		% of Total	47.1%	17.2%	64.3%
	male	Count	44	12	56
		% within sex	78.6%	21.4%	100.0%
		% of Total	28.0%	7.6%	35.7%
Total	Count		118	39	157
	% within sex		75.2%	24.8%	100.0%
	% of Total		75.2%	24.8%	100.0%

Table 4 showed the attitude of health workers towards COVID 19 vaccination based on gender. The findings of the study indicated that 73.3% of females and 78.6% of male health workers had negative attitude towards COVID-19 vaccination. Thus, health workers in Yenegoa had negative attitude towards COVID 19 vaccination.

Testing Hypotheses

Ho1: There is no significant relationship between knowledge of Covid-19 Infection among health workers in some selected health facilities in Yenagoa, Bayelsa State based on age

Table 5: Binary logistic regression on knowledge of COVID 19 infection based on age+

Demographic variables	SE	Wald	df	Sig	Exp(B)	95% CI for EXP(B)		Decision
						Lower	Upper	
20-29yrs	REF	1.354	3	.716				
30-39yrs	.865	1.178	.539	1	.463	2.374	.236 23.908	Accept
40-49yrs	1.705	1.466	1.353	1	245	5.500	.311 97.232	
50-59yrs	19.123	8380.814	.000	1	.998	201934355356	.000	
constant	2.079	1.061	3.844	1	.050	8.000		

The result on bivariate analysis showed a non-significant relationship between age of health workers and knowledge of COVID 19 infection. The analysis revealed that respondents aged 30-39 years were about 2 times (OR= 2.37, 95% CI: 0.24-23.90) more likely to be knowledgeable of COVID 19 infection compared to those 20-29years. Also, respondents aged 40-49years were about 6times (OR=5.50, 95%CI: 0.31-97.23) more likely to be knowledgeable of COVID 19 infection compared to those aged 20-29 years. Thus the null hypothesis which states that there is no significant relationship between age of health workers and knowledge of COVID 19 was thus not rejected but accepted.

Ho2: There is no significant relationship between knowledge of COVID-19 vaccine action among health workers in some selected health facilities in Yenagoa, Bayelsa State based on age.

Table 6: Binary logistic regression on knowledge of mechanism of action of COVID-19 vaccine based on age

Demographic variables	B	SE	Wald	df	Sig	Exp(B)	95% CI for EXP(B)		Decision
							Lower	Upper	
20-29yrs	REF		1.196	3	.754				
30-39yrs	-1.110	1.090	1.037	1	.308	.330	.039	2.790	Accept
40-49yrs	-1.068	1.113	.921	1	.337	.334	.039	3.045	
50-59yrs	-1.253	1.153	1.180	1	.277	.286	.030	2.740	
constant	2.079	1.061	3.844	1	.050	8.000			

$p > 0.05$

The result on bivariate analysis showed a non-significant relationship between age of health workers and knowledge of COVID-19 vaccine action. The analysis although revealed that respondents aged 30-39years were about 3 times (OR= 0.33, 95% CI: 0.39-2.90) less likely to be knowledgeable of COVID-19 infection compared to those 20-29years. Also, respondents age 40-49years were about 2.9times (OR=0.34, 95%CI: 0.391-3.04) less likely to be knowledgeable of COVID 19 infection compared to those age 20-29years. Thus the null hypothesis which states that there is no significant relationship between age of health workers and knowledge of mechanism of action of COVID-19 vaccine was thus not rejected.

Ho3: There is no significant relationship between knowledge of Covid-19 vaccine side effects among health workers in some selected health facilities in Yenagoa, Bayelsa State based on gender.

Table 7: Binary logistic regression on knowledge of COVID-19 vaccine side effects based on gender

Demographic Variables (Gender)	B	SE	Wald	df	Sig	Exp(B)	95% CI for EXP(B)		Decision
							Lower	Upper	
male	-.686	.398	2.974	1	.085	.504	.231	1.098	Reject
constant	1.409	.336	17.543	1	.000	4.091			

$p > 0.05$

The result on bivariate analysis showed a non-significant relationship between gender of health workers and knowledge of side effects of COVID-19 vaccine. The analysis although revealed that respondents who are males were 2 times (OR=0.504, 95% CI: 0.231,1.098) less likely knowledgeable of the side effects of COVID-19 vaccination compared to those who are females. The null hypothesis which states that there is no significant relationship between gender and knowledge of COVID-19 side effect was therefore rejected.

Ho4: There is no significant relationship between knowledge and attitude towards covid-19 infection and vaccination among health workers in some selected health facilities in Yenagoa, Bayelsa state based on gender.

Table 8: Binary logistic regression on attitude towards COVID 19 vaccination based on gender

Demographic	B	SE	Wald	df	Sig	Exp(B)	95% CI for EXP(B)		Decision
Variables (Gender)							Lower	Upper	
male	.291	.396	541	1	.462	1.338	.616	2.906	Reject
constant	1.299	.326	15.917	1	.000	.273			

$p > 0.05$

The results on Table 8 indicated the attitude of health workers towards COVID-19 vaccination based on gender. On bivariate analysis the findings established a non-significant relationship between attitudes of health workers towards COVID-19 vaccination based on gender ($p > 0.05$). Also, the findings of the study demonstrated that male health workers were 1.3 times (OR=1.33, 95% CI: 0.62-2.90) more likely to possess negative attitude towards COVID 19 vaccination compared to the females. The hypothesis is there rejected.

Discussion of Findings

The result obtained indicated a high knowledge of COVID-19 infection among health workers. Respondents aged 30-39years were about 2 times (OR= 2.37, 95% CI: 0.24-23.90) more likely to be knowledgeable of COVID-19 infection compared to those 20-29years. Also, respondents aged 40-49years were about 6times (OR=5.50, 95%CI: 0.31-97.23) more likely to be knowledgeable of COVID-19 infection compared to those aged 20-29years. Thus the null hypothesis which states that there is no significant relationship between age of health workers and knowledge of COVID-19 was thus not rejected. This result is expected because health workers by virtue of their exposure, experience and training should be knowledgeable.

The result also indicated that knowledge of COVID-19 vaccine action was high (72.5%, 73.3%, and 88.9%) among respondents aged 20-29years, 30-39years and 50-49years respectively. However, knowledge was moderate (69.6%) among respondents aged 40-49years. The result also revealed a non-significant relationship between age of health workers and knowledge of COVID-19 vaccine action. Respondents aged 30-39years were about 3 times (OR= 0.33, 95% CI: 0.39-2.90) less likely to be knowledgeable of COVID-19 infection compared to those aged 20-29years. Also,

respondents aged 40-49 years were about 3 times ($OR=0.34$, 95%CI: 0.391-3.04) less likely to be knowledgeable of COVID-19 infection compared to those age 20-29 years. Thus the null hypothesis which states that there is no significant relationship between age of health workers and knowledge of mechanism of action of COVID-19 vaccine was thus not rejected but accepted. This result is also expected because of health workers exposure, training and experience. The result is contrary to that of Saiful et al. (2021) in their study carried out online on an anonymous population which revealed that knowledge regarding COVID-19 vaccinations was low (28%) among more than half of the population and knowledge regarding COVID-19 vaccinations was not significant (20%) in terms of participants' sex. Result on knowledge of vaccine side effects showed that knowledge of COVID-19 vaccine side effects was high among male (80.4%) and moderate among female health workers (67.3%).

Test of hypothesis showed a non-significant relationship between gender of health workers and knowledge of side effects of COVID-19 vaccine. The analysis although revealed that respondents who are males were 5 times ($OR=0.504$, 95%CI: 0.23-1.098) less likely to be knowledgeable of the side effects of COVID-19 vaccine side effects compared to those who are females. The null hypothesis which states that there is no significant relationship between gender and knowledge of COVID-19 side effect was therefore rejected. This result is not expected because male and female health workers have the same level of exposure and training, however experience may differ which makes for the difference in knowledge level.

Findings on attitude of health workers towards COVID 19 vaccination based on gender indicated that 73.3% of females and 78.6% of male health workers had negative attitude towards COVID-19 vaccination. Hypothesis tested established a non-significant relationship between attitude of health workers towards COVID-19 vaccination based on gender ($p>0.05$). The findings demonstrated that male health workers were 1.3 times ($OR=1.33$, 95% CI: 0.62-2.90) more likely to possess negative attitude towards COVID-19 vaccination compared to female health workers. The null hypothesis was therefore rejected. This result is expected because most males are often non-challant about issues compared to females. This result is in line with an internet-based cross-sectional survey conducted between December 8 and 28, 2020 by Cyprus International Institute for Environmental and Public Health which revealed that a considerable rate of nurses and midwives in Cyprus reported unwillingness to receive a COVID-19 vaccine due to vaccine-related concerns (Fakonti et al., 2021). This implies a negative attitude.

In a later study by Saiful et al. (2021) carried out online on an anonymous population findings revealed that, attitudes were significantly associated with only sex. Importantly, the majority of participants (78%) showed positive attitude towards COVID-19 vaccine contrary to the findings of this current study. In a related study by Nzaji et al (2020), on acceptability of vaccination against covid-19 among health care workers in the demographic republic of Congo, result showed that male health workers ($ORa= 1.17$, 95% CI: 1.15-2.60) primarily doctors ($ORa = 1.59$; 95% CI: 1.03-2.44) had positive attitude towards COVID-19 vaccine ($ORa = 11.49$; 95% CI: 5.88-22.46). Not many studies have been conducted regarding knowledge and attitude on COVID-19 infection and vaccination, hence these few citations.

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IMPACT OF COVID-19 LOCKDOWN ON UNWANTED PREGNANCIES AMONG WOMEN OF CHILDBEARING AGE (15-49 YEARS) IN RIVERS STATE

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Abstract

This study examined the impact of COVID-19 lockdown on unwanted pregnancies among women of childbearing age (15 - 49 years) in Rivers State. Descriptive survey design was employed for the study. The population consisted of 1000 women of child bearing age (unmarried and married) in Kula kingdom. Purposive sampling technique was employed to obtain the sample. The sample size was 286 respondents (unmarried 150 and married 136) which were obtained through the Taro Yamane formula and a structured questionnaire was used to collect data. A reliability coefficient of 0.77 was obtained to show that the instrument was reliable using Pearson Product Moment Correlation Statistic. Data collected were analysed using mean, standard deviation, z-test to test the hypothesis. Findings indicated that causes of unwanted pregnancy were eagerness of adolescent female, peer group influence, poverty, lack of sexuality education and lack of parental supervision. It was recommended that sexuality education be taught in junior and senior secondary schools, age group meetings, churches, mosques, women gatherings.

Keywords: impact, COVID-19, lockdown, unwanted, pregnancy, women, childbearing

INTRODUCTION

The bedrock of COVID-19 (Coronavirus disease 2019) is convincingly linked to Wuhan, China. This strand of corona virus has affected over two hundred (200) countries of the world. According to World Health Organization (2021), a total of 229,856,719 confirmed cases of covid-19 including 4,713,543 deaths. In order to reduce to the barest minimum a total of 5,874,934,542 vaccine doses have been administered. To this extent, a total of 191,950 deaths have been recorded in Nigeria (NCDC, 2021). However, this pandemic has a huge impact on the disruption of maternal healthcare services. One of the components of maternal health services is family planning services which is capable of preventing unwanted pregnancy. This has been compromised due to the COVID-19 pandemic restrictions and high indoor activities. Nevertheless, there is limited evidence to show the high rate of unwanted pregnancies during the covid-19 pandemic. Hence the main aim of this study was to examine the impact of COVID-19 lockdown on unwanted pregnancies among women of childbearing age (15-49years) in a rural community in Rivers State.

Lockdown is a restriction policy for people or community to stay where they are as a result of specific risks to themselves or to others if they can move and interact freely. Also, the term 'stay at home or shelter-in-place' is often used or lockdown that affect an area rather than specific locations. This can only be initiated by someone in a position of authority (Taylor et al., 2020). This can also be used to protect people inside a facility, for example, cyber cafe or computing system from a threat or other external events. This now tends to increase proximity of individuals in one specified location.

According to Cousins (2020), COVID-19 has devastating effect on women and girls on one hand, and to a larger perspective of the general population. Also, this effect has made many women to experience devastating health and social consequences. In line with her view, UNFPA (2020) predicts that, there could be up to seven (7) million unintended pregnancies worldwide as a result of the crisis, with potentially thousands of deaths from unsafe abortion and complicated deaths due to inadequate access to emergency care. Similarly, Marie Stopes International (MSI), which operates in 37 countries, predicts that the closure of their services would result in up to 9.5 million vulnerable

women and girls losing access to conception and safe abortion service in 2020. In their own words, the country wide lockdown could result to about 2.7million unsafe abortion and 11,000 pregnancy related deaths.

This scenario is not far from the Nepal and India; both had their MSI operated clinics closed due to the covid-19 lockdown. This organization sincerely provides family planning services to the women of childbearing age and also ensuring that these services gets to those women living in hard-to-reach areas have now been impeded due to the general lockdown.

Unwanted pregnancy according to the Centre for disease control and prevention (CDC, 2021) is a pregnancy that is either unintended such as the pregnancy occurred when no children or no more children were desired. Sometimes, this pregnancy mistimed because it comes at a period it is not desired. Nevertheless, this situation can prevail when there is a contraceptive failure, non use of contraceptive services and likely rape.

Women of childbearing age according to Watson (2018) are those who can get pregnant and bear children from puberty when they start getting their menstrual flow to menopause when they stop getting it. It is obvious that a woman is a feminine gender with the corresponding reproductive features such as the vagina, breast, uterus, fallopian tube, ovaries. According to the National Bureau of Statistics (NBS, 2017), women under the age of childbearing are those women who experiences the age-specific fertility rate (ASFR). This authenticates the above fertility age bracket of 15-49years. This means that the likelihood of unwanted pregnancy is sure under favourable and unfavourable environment. Also, the United Nation (UN) World Population Prospects (2017) opines that Nigeria's population could reach 40 million by 2050. However, this could be curtailed if the nation can invest richly and bountifully in family planning. Also, increase in skills enhancement and job creation which will in addition to child spacing, improvement in child survival and proper education of the girl will lead to a delay in early marriage and child birth which will in turn aid the prevention of unintended pregnancy.

World health organization (2021) is of the view that covid-19 lockdown was aimed at preventing the contact and spread of the coronavirus among the various strata of the society. The organization further explained the impact of the lockdown, on girls, boys, women and men, differently with regards to health and economic burdens. They also identified groups that are already disadvantaged such as the women of childbearing age, who experiences the greatest risks and impacts of the covid-19 lockdown.

According to Adekan et al. (2021) in a study titled "Effect of COVID-19 Pandemic on provision of sexual and reproductive health services in primary health facilities in Nigeria: a cross-sectional study. The objective of their study was to investigate the extent to which the COVID-19 pandemic and related lockdowns had affected the provision and utilization of essential reproductive health, maternal and child health, and adolescent health services in primary health facilities, and the challenges in service delivery across ten Nigerian States. We believe the results would be useful in planning the comprehensive delivery of resilient SRHR services in Nigeria in ways to enable them to overcome the fragilities posed by COVID-19. Specific questions were asked on service delivery before, during and after the lockdowns. The specific services whose functionality was investigated were family planning, antenatal care, delivery (intra-partum) care, immunization services, and adolescent reproductive health services.

The details of these services are as provided in the national guidelines for PHC system in Nigeria. The respondents were asked what reproductive, maternal, child, and adolescent and adolescent health (RMNCH) services they provided before the pandemic started, during the lockdown, and after the lockdown. The response was a multiple choice 8-item list which included family planning, antenatal, delivery, postnatal, child immunization, childcare, adolescent care, and others (to be specified). Response was also solicited on the closure of the facilities during the

lockdown and whether services were offered fully or partially, the number of clients per week (records were sighted), difficulties in service delivery such as stock-outs and transportation, harassment by law enforcement agents (undue delay and questioning by the police or other law enforcement agents), the availability of personal protective equipment, and the identification and management of persons with suspected symptoms of COVID-19. (Li et al., 2020).

Statement of the Problem

This study is focused on examining impact of COVID-19 lockdown on unwanted pregnancies among women of child bearing age (15-49years) in Kula Kingdom in Akuku-Toru Local Government Area. It has been observed that unwanted pregnancies have been on the increase in our indigenous community which may be due to eagerness of adolescent females, peer group influence, poverty, lack of sexuality education and lack of parental supervision. Also, the inactivity of the teens can be a contributory factor to unwanted pregnancies in the community. Hence, the researcher seeks to examine the impact of covid-19 lockdown on unwanted pregnancies among women of childbearing age (15-49years) in Kula Kingdom in Akuku-Toru Local Government Area, Rivers State.

Purpose of the Study

The aim of the study was to examine impact of covid-19 lockdown on unwanted pregnancies among women of childbearing age in Kula Kingdom in Akuku-Toru Local Government Area, Rivers State. Specifically, the study sought to:

1. Examine causes of unwanted pregnancies in Kula Kingdom, Akuku-Toru Local Government Area, Rivers State.
2. Determine the impact of covid-19 lock down on unwanted pregnancies among women of childbearing age in Kula Kingdom, Akuku-Toru Local Government Area, Rivers State.

Research Questions

The following research questions guided the study:

1. What are the predisposing causes of unwanted pregnancies among women of child bearing age in Kula Kingdom, Akuku-Toru Local Government Area, Rivers State?
2. To what extent does covid-19 lock down influence unwanted pregnancies among women of child bearing age in Kula Kingdom in Akuku-Toru Local Government Area, Rivers State?

Hypothesis

There is no significant difference between the mean ratings of women of childbearing age in Kula Kingdom in Akuku-Toru Local Government Area with regards to impact of COVID-19 lockdown on unwanted pregnancies.

Methodology

The study adopted a descriptive survey design. The study was carried out in Kula Kingdom in Akuku-Toru Local Government Area, Rivers State. The population of the study consisted of 1000 women of child bearing age in Kula Kingdom in Akuku-Toru Local Government Area, Rivers State. From the study population, a sample size of 286 women of child bearing age (WCBA) was randomly selected, Kula Kingdom comprises of women of child bearing age (WCBA). The instrument used was a structured questionnaire tagged 'impact of covid-19 lock down on unwanted pregnancies among Women of Child bearing Age Questionnaire' (ICLUPAWCAQ) and structured in a four (4) point rating scale. The researcher personally administered the instrument on the selected respondents. Among the 286 questionnaire administered, 276 were retrieved which gave a

percentage rate of 96.5%. The instrument was validated by two experts to determine its adequacy, appropriateness for the study and for its proper wordings. The Pearson Product Moment Correlation Statistics method was used for the reliability test and yielded reliability co-efficient of 0.77. The data collected from the study were analysed using mean and standard deviation. Mean value less than 2.50 was disagreed while mean value equal or greater than 2.50 was agreed for the research questions. Decision rule for the test of hypothesis was accepted if the calculated value of Z is less than the critical value and if the calculated value of Z is greater than Z critical the null hypothesis was rejected.

Results

Research Question One: What are the predisposing causes of unwanted pregnancies among women of childbearing age in Kula Kingdom, Akuku-Toru Local Government Area, Rivers State.?

Table 1: Summary of mean scores on the Predisposing causes of unwanted Pregnancies among Women of Childbearing age

S/N	Item Statement	Unmarried=14 5 Mean	S.D	Married = 131 Mean	S.D	Remark
1.	Eagerness of adolescent females to have sex.	2.72	26.54	2.57	25.00	Agreed
2.	Peer group influence induced sex.	2.62	25.99	2.25	23.74	Disagreed
3.	Poverty	2.86	26.79	2.73	23.30	Agreed
4.	Lack of sexuality education.	3.02	28.35	3.14	27.56	Agreed
5.	Lack of parental supervision.	3.01	29.64	3.02	30.16	Agreed
6.	Constant presence of the male partner.	2.83	28.64	3.14	30.02	Agreed
7.	Non-use of contraceptive device.	3.03	29.07	3.40	32.98	Agreed
	Grand Mean	2.87	27.86	2.89	27.54	

Field Survey, 2021

The result from research Question 1 as presented in Table 1 reveals that all the respondents on the unmarried group agreed to item 1-7 while those of married agreed to item 1,3-7 and disagreed on item 2. However, the grand mean of 2.87 and 2.89 is above the criterion mean of 2.50. Hence, both the unmarried and married women of child bearing agreed that, there are predisposing causes of unwanted pregnancies in kula kingdom in Akuku-Toru Local Government Area, Rivers State.

Research Question Two: To what extent does COVID-19 lock down influence unwanted pregnancies among women of childbearing age in Kula Kingdom in Akuku-Toru Local

Government Area, Rivers State?

Table 3: Summary of mean scores on the extent to which COVID-19 lock down influence unwanted pregnancies

S/N	Item Statement	Unmarried Mean=145	S.D	Married Mean=131	S.D	Remark
1.	Low academic interest	3.05	29.86	3.18	29.34	Accepted
2.	Ignorance to sexuality education	3.08	30.11	3.09	26.38	Accepted
3.	Inadequate usage of contraceptive.	2.86	26.80	3.37	32.80	Accepted
4.	High unemployment rate.	3.12	30.35	3.24	31.06	Accepted
5.	Increase in Libido.	3.10	30.35	3.43	32.39	Accepted
6.	High rate of poverty.	3.32	33.85	3.51	33.33	Accepted
7.	High curiosity of the adolescent females.	3.18	30.08	3.20	23.56	Accepted
	Grand Mean	3.10	30.20	3.29	25.69	

Field Survey, 2021

The result from research question 2 indicates that all respondents agreed to items 1-7. Hence, since the grand mean of 3.10 and 3.29 are above the criterion mean of 2.50, both unmarried and married women of childbearing age agreed that COVID-19 lockdown influence unwanted pregnancies to a Kula kingdom Akuku-Toru Local Government Area, Rivers State.

Table 3: Z-test on the influence of COVID-19 lockdown on unwanted pregnancies among unmarried and married women of child bearing age

Respondents	\bar{X}	SD	N	DF	Z-cal	Zcrit	Decision
Unmarried WCBA	3.10	30.20	145				
				274	0.06	1.98	Accepted
Married WCBA	3.29	25.69	131				

Research data output, 2021

The results in table 3 shows that unmarried women of childbearing age (WCBA) had mean and standard deviation scores of 3.10 and 30.20 respectively, while married women of childbearing age (WCBA) had mean and standard deviation, scores of 3.29 and 25.69 respectively. On the basis of Z-comparison, the calculated Z-ratio (0.06) is lesser than, the critical value (1.96), the hypothesis was accepted. Therefore, the null hypothesis of influence of COVID-19 lockdown on unwanted pregnancies among unmarried and married women of child bearing age in Kula Kingdom does not differ significantly, is retained for insufficient empirical evidence.

Discussion of Findings

The findings in research question 1 revealed that eagerness of adolescent females to have sex, peer group influence induced sex, poverty, lack of sexuality education, lack of parental supervision, constant presence of the male partner and non use of contraceptive device are some of the predisposing causes of unwanted pregnancies among women of childbearing age. The findings of the study agree with the view of CDC, 2021 that unintended pregnancy occurs when no children or more children desired which can prevail due to contraceptive failure, non-use and likely rape. Also, Watson (2018) corroborated by stating that, the women of childbearing age are those who can get pregnant owing to the fact that their menstrual flow is in agreement with reproductive features.

The findings in research question 2 indicated that low academic interest, ignorance to sexuality education, inadequate usage of contraceptive, high unemployment rate, increase in libido, high rate of poverty and high curiosity of the adolescent females are some of the impacts of COVID-19 lockdown on the unmarried and married women of childbearing age. The findings of the study disagree to Nigeria Center for Disease Control (NCDC) (2021) intention for the COVID-19 lockdown policy is aimed at preventing and reducing the contact and the spread of COVID-19 disease among the population only. Therefore, the result of the hypothesis shows that there is no significant difference in the mean rating of unmarried and married women of childbearing age on the influence of COVID-19 lockdown on unwanted pregnancies in Kula kingdom Akuku-Toru Rivers State.

Conclusion

From the findings, it was summarized that COVID-19 lockdown has really devastated the activities of women of childbearing age to the extended that their source of livelihood and other social engagement aside their domain. As a result of this their men counter-part are always within their reach also to some abuse of their fundamental human rights leading to ripe. Hence, all this actions in one way or the other leads to unwanted pregnancies.

Recommendations

Based on the findings the following recommendations were made:

1. Sexuality education can be taught in junior in senior high schools, church, mosques, women gatherings and age group meetings.
2. Government and other stakeholders should provide information on how to prevent unplanned pregnancy and child neglect.

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EVALUATION OF PHYSICOCHEMICAL CHARACTERISTICS OF SOILS AT AUTO MECHANIC WORKSHOPS IN BORI AND ENVIRONS, RIVERS STATE, NIGERIA

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Abstract

This study evaluated the physicochemical characteristics of soils at auto mechanic workshops in Bori and environs with a view to ascertaining their possible impact on the surrounding soils. Three auto mechanic workshops were identified as impacted sites with a control site where neither auto mechanic repairs, industrial nor profitable undertakings were selected for the study. Surface soils were sampled, prepared and analyzed following standard procedures. The pH values of the soils across the three auto mechanic workshops ranged from 4.84 to 5.23 with mean value of 5.01 ± 0.16 . The total organic carbon of the soils ranged from (%) 3.347-4.031 with mean value of 3.69 ± 0.27 . The total organic matter ranged from (%) 6.403 to 6.949 with mean value of 6.66 ± 0.22 . Total nitrogen contents ranged from (%) 0.186 to 0.202 with mean value of 0.19 ± 0.006 . Phosphorus content (mg/kg) ranged from 3.198 to 4.907 with mean value of 3.99 ± 0.70 . The electrical conductivity ($\mu\text{S}/\text{cm}$) of the soils ranged from 86.43 to 103.63 with mean of 94.32 ± 7.09 . The soil textural sorts revealed that the soils remained sandy loam. The results of the analysis revealed that the mean concentrations of the studied physicochemical parameters were all higher than that of the control sites except for phosphorus, %sand and %silt. This is an indication that the significant increase in concentrations of the physicochemical parameters is a direct consequence of the activities of the auto mechanic workshops.

Keywords: bori, contaminants, mechanic workshop, physicochemical characteristics, soil

1.0 INTRODUCTION

The soil is one of the special gifts of nature and is very essential to all living organisms. It serves as housing for many animals, produces vegetables, supplies nutrient for floras, stores minerals, and as a reservoir of water (H_2O). Besides being a source of H_2O and florate nutrients, it is also the medium for the detritus food chain. Soil is a multiphase and extremely vigorous system, with several functions. It is the main producer of biomass plus synthetic-free materials, supports bio-diversity expansion, and offers the foremost basis for carbon, in addition to playing a major role in humanoid activities as well as in the existence of the bionetwork (Horsfall & Spiff, 2013). Exploitation as a result of man's desire for ultimate need, satisfaction and comfort have continuously degraded its natural quality and resulting to contamination and pollution from various sources. As a consequence of these actions on the natural processes, several environmental difficulties have arisen.

Population explosion, urbanization plus quest to satisfy man's needs have created more awareness to the establishment of many small scale industries. Auto mechanic workshop remains among one of the fastest growing small scale industries that are established. The clustering plus littering of mechanic workshop along almost every street and road in Nigeria in general, and Bori and its environs in particular, calls for concern due to the various activities and the kind of wastes that are generated.

However, it is suspected that persistence and accumulation of the wastes may alter the

physicochemical composition of the soil around auto mechanic workshops and can ultimately result to contamination and pollution. Pollution effects of auto mechanic workshops in Bori have received poor attention despite the fact that these pollutants can disfigure the soil physicochemical constituent and consequently alter the natural chemistry of the soil. The present study is predicated on these findings and has necessitated the evaluation of pollution resulting from the activities of auto mechanic workshop clustered in Bori and its environs. This is done in order to assess the hazards resulting from the continuous exposure to the bio-network and the impact on plants and microorganisms in the soil. The environment is seriously under threat due to human economic activities. Various substances that contaminate the environment are released as waste into the environment not regarding the rules and regulations binding their disposal (Inobema et al., 2014).

Soil functions as natural sink for numerous wastes and contaminants. When contaminants are discharged into the soil, they interact with it and thereby alter the soil chemical plus physical features given to man by nature (Edori & Iyama, 2017). The adulteration of the soil poses great vulnerability to humanoid plus the bio-network as soil remains an indispensable basis for agricultural production which is crucial to humanoid development. The fate of contaminants in soil is important in terms of evaluating their possible exposure to humanoids. Another significant element is the complexity of pathways determined by emission sources, interactions with soil surfaces and changes over time in the chemical and biological conditions in the specific environment. This paper investigated the physicochemical characteristics of soils used for auto mechanic works in Bori, Rivers State, Nigeria.

2.0 MATERIALS AND METHODS

2.1 Area of Study

The study area was Bori and environs. Bori is the local government headquarters of Khana Local Government Area of Rivers State, in Niger Delta of Nigeria and the traditional headquarters of the Ogoni people. It is located on a geographical coordinate of 4° 40' 22" North, 7° 22' 13" East, with an area of 20 square mile (50 Km²) of land east and southeast of Port Harcourt. Bori Urban Area has adjoining communities including Bori town, Wiiyaakara, Kpong, Kor, Bua-Kaani, Yeghe, Bo-Ue, Zaakpor, and Betem-3. The indigenous people are involved in the production of all kinds of agricultural products and fishes as their sole occupation, as they are blessed with both arable land and H₂O (fresh and salt). With the presence of a daily popular market, Bori serves as commercial center for the people of Rivers Southeast Senatorial District in particular and the entire State in general, and other people of neighboring state like Annang people of Akwa-Ibom State.

Apart from the local government council secretariat, Bori is the host of the foremost Rivers State polytechnic now Kenule-Benson Polytechnic, Bori. The presence of the central market and the institution in the city, large population of people are attracted making the city very busy with vehicular movement and presence of all kinds of automobile, resulting to a boost in the number of established auto mechanic workshops.

2.2 Sampling and Sample Preparation

Soil samples were collected twice a month for three months (October, November and December, 2019), from three (3) different auto mechanic workshops using a hand auger. At each location, surface soil samples were randomly collected from the same depth of 0 – 20cm. These samples were representatives of top soil around each workshop (this is because much of the root uptake of contaminants by floras occurs in this zone (Wokoma et al., 2018). Abenchi et al. (2010) also affirmed that surface soils are the first locus of input of contaminants where they tend to accumulate on a relatively long term basis forming composite samples.

Control soil samples were randomly obtained from the same depth and from a pristine land that is a central point and not less than 11Km away from each impacted site, where neither auto mechanic repairs, industrial nor commercial activities are (or have been) carried out. Thus, a total of

twenty (20) soil samples were obtained and analyzed in three months for six determinations. Each composite sample was then bulked down to obtain a representative sample using a conning and quartering method. All samples were air-dried to constant weight to avoid microbial degradation (Kakulu, 1993). The dried samples were homogenized by pulverizing with a clean porcelain mortar and pestle, sieved through 2 mm plastic sieve and stored in labeled plastic cans. All the parameters were determined by standard analytical procedures.

3.0 RESULTS AND DISCUSSION

Results of the level of pH, percentage total organic carbon, total organic matter, total nitrogen, phosphorus, electrical conductivity, and particle size density are presented below.

Table 1: Results of monthly determinations of the physicochemical parameters of Station 1

Determinations		pH	TOC	Parameters			EC	Particles Size Density		
				TOM	TN	P		%Clay	%Sand	%silt
October	1 st	5.12	4.214	6.712	0.186	4.169	86.23	30.71	60.31	12.5
	2 nd	4.98	3.513	6.594	0.197	4.072	86.35	30.69	48.22	10.4
November	1 st	5.16	3.594	6.510	0.189	3.971	86.57	30.55	48.11	9.3
	2 nd	5.13	3.891	6.296	0.197	3.732	86.34	30.38	58.25	13.1
December	1 st	4.29	3.532	6.206	0.179	3.670	86.61	30.25	60.16	10.0
	2 nd	4.36	3.54	6.100	0.168	3.618	86.48	30.12	75.05	11.9
Min. value		4.29	3.513	6.100	0.168	3.618	86.23	30.12	48.11	9.3
Max. value		5.16	4.214	6.712	0.197	4.169	86.61	30.71	75.05	13.1
Mean		4.840	3.714	6.403	0.186	3.872	86.43	30.45	58.35	11.2

Table 2: Results of monthly determinations of the physicochemical parameters of station 2

Determinations		pH	TOC	Parameters			EC	Particles Size Density		
				TOM	TN	P		%Clay	%Sand	%silt
October	1 st	5.29	3.19	6.93	0.201	5.031	97.89	22.74	70.01	11.35
	2 nd	5.03	3.212	6.83	0.192	4.773	89.37	21.65	54.15	13.66
November	1 st	5.33	3.41	6.73	0.197	4.831	96.57	24.5	68.09	13.36
	2 nd	5.23	3.431	6.53	0.183	4.863	87.38	23.35	65.11	14.21
December	1 st	5.17	3.42	6.43	0.189	5.002	96.67	22.28	64.09	14.58
	2 nd	5.33	3.419	6.33	0.196	4.942	89.46	20.12	64.05	12.64
Min. value		5.03	3.19	6.33	0.183	4.773	87.38	20.12	54.15	11.35
Max. value		5.33	3.431	6.93	0.201	5.031	97.89	24.5	70.01	14.58
Mean		5.23	3.347	6.63	0.193	4.907	92.89	22.44	64.25	13.3

Table 3: Results of monthly determinations of the physicochemical parameters of station 3

Table 3. Results of monthly determinations of the physicochemical parameters of station 1										
Determinations		Parameters					Particles Size Density			
		pH	TOC	TOM	TN	P	EC	%Clay	%Sand	%silt
October	1 st	5.23	4.402	7.243	0.201	3.186	102.91	35.57	52.36	9.33
	2 nd	5.18	4.415	7.155	0.199	3.195	104.85	31.68	55.56	10.27
November	1 st	5.02	4.321	7.047	0.197	3.229	101.76	37.48	56.47	11.25
	2 nd	4.93	4.361	6.851	0.216	3.197	103.5	28.56	53.27	10.05
December	1 st	4.79	3.356	6.741	0.203	3.189	105.44	34.47	54.16	9.89
	2 nd	4.61	3.331	6.657	0.196	3.192	103.32	45.54	54.28	9.81
Min. value		4.61	3.331	6.657	0.196	3.186	101.76	28.56	52.36	9.33
Max. value		5.23	4.415	7.243	0.216	3.229	105.44	45.54	56.47	11.25
Mean		4.960	4.031	6.949	0.202	3.198	103.63	35.55	54.35	10.1

Table 4: Mean concentrations of the physicochemical parameters of soil across the three (3) auto mechanic workshops (n=6)

Parameters	Auto Mechanic Workshops			Range	Mean \pm SD	Mean of control
	1	2	3			
pH	4.84	5.23	4.96	4.84 – 5.23	5.01 \pm 0.16	4.480
TOC(%)	3.714	3.347	4.031	3.347 – 4.031	3.69 \pm 0.27	1.986
TOM(%)	6.403	6.632	6.949	6.403 – 6.949	6.66 \pm 0.22	3.434
TN(%)	0.186	0.193	0.202	0.186 – 0.202	0.19 \pm 0.006	0.099
P(mg/kg)	3.872	4.907	3.198	3.198 – 4.907	3.99 \pm 0.70	5.896
EC(μs/cm)	86.43	92.89	103.63	86.43 – 106.63	94.32 \pm 7.09	63.41
Particle size density						
% Clay	30.45	22.45	35.55	22.45 – 35.55	29.48 \pm 5.39	16.35
% Sand	58.35	64.25	54.35	54.35 – 64.25	58.98 \pm 4.06	71.08
% Silt	11.20	13.30	10.10	10.10 – 13.30	11.53 \pm 1.32	12.58

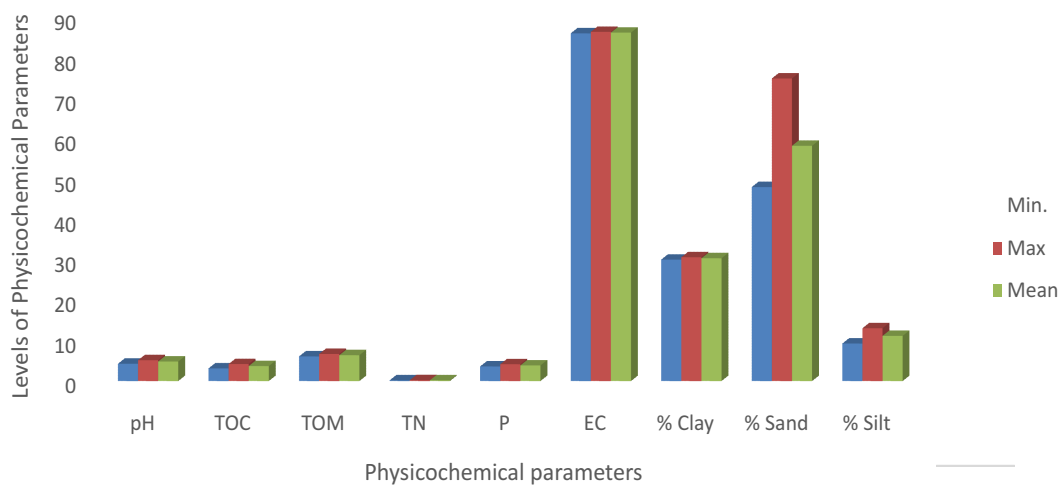


Fig.1: Minimum, maximum and mean values of physicochemical parameters of soils at Station 1

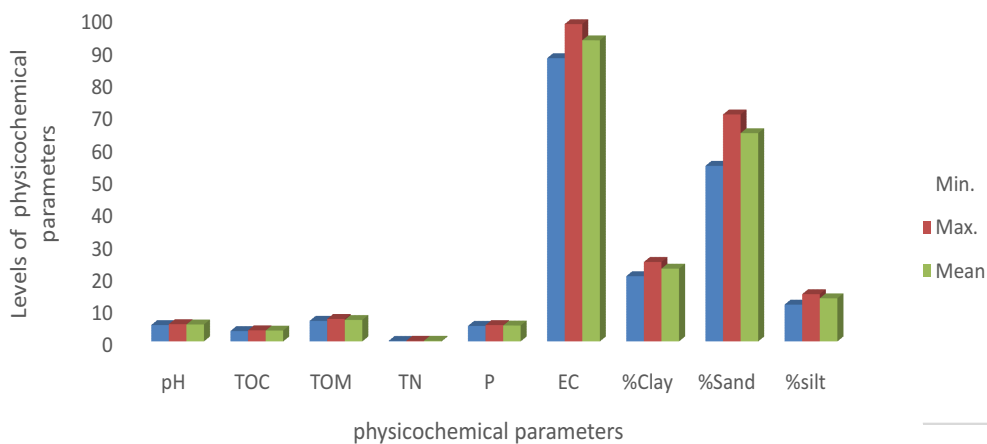


Fig.2: Minimum, maximum and mean values of physicochemical parameters of soil at Station 2

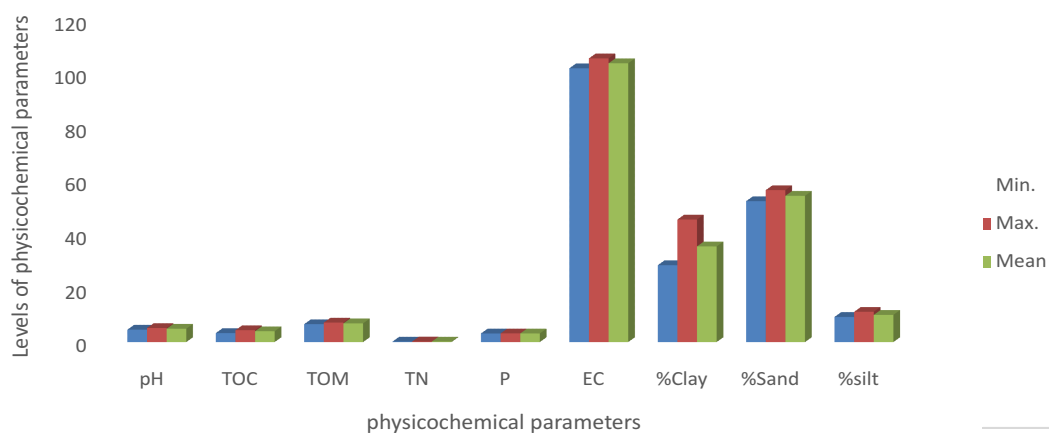


Fig.3: Minimum, maximum and mean values of physicochemical parameters of soils at Station 3

4.0 DISCUSSION

The results from the analysis of monthly determination for pH, % total organic carbon, total carbon-based matter, total nitrogen, phosphorus, electrical conductivity, and particles size density for the three auto mechanic workshops, their ranges and mean values are presented in Tables 1-3. Mean values obtained from the determinations together with that of the control are presented in Table 4 and the bar chart.

4.1 pH

Tables 1- 3 present the result of soil pH from the three auto mechanic workshops. The soil pH in Station 1 ranged between 4.29 and 5.16 with a mean value of 4.84. Station 2 has a pH range from 5.03 to 5.33 with a mean value of 5.23. The pH of Station 3 varied between the ranges of 4.61 and 5.23 with a mean value of 4.96.

From Table 4, Station 1 has the lowest pH value of 4.84 and Station 2 has the highest pH value of 5.23. This shows that the soils have strongly acidic pH ranges of 4.84 – 5.23 across the three (3) auto mechanical workshops with a mean value of 5.01 ± 0.16 . The values of pH obtained in this study are in the same range with the values published by Pam et al. (2013), Osakwe (2014), Nebo et al. (2018), Adebayo et al. (2017), but lower than those reported by Sadick et al. (2015), Odueze, et al. (2017), Olayinka et al. (2017), and Oguntimehim (2008) and higher than those reported by Oviasogie and Ofomaja (2007) in similar studies.

Statistically, comparing the results obtained from the mechanic workshops with that of the control in Table 4 above, it could be observed that there is no significance difference between the pH of the soil around auto mechanic workshops 1, and 3 with that of the control that falls within the pH denomination of very strongly acidic (t-value at $p < .05$). The pH values of auto mechanic workshop 2 have pH values higher (less acidic) than the control. This suggests that the activities in the auto mechanic workshops probably from discharged motor batteries contributed to the acidity of the soils.

The pH is a major factor that influences the chemistry of metals in soil (Gambrell, 1994). Mobility of heavy metals in soil is influenced by pH concentrations. Solubility of metallic element is increased by decrease in soil pH and favours availability, mobility and redistribution making them more readily available to floras (Oliver et al., 1998). Generally, the pH of soils around these areas are acidic and the availability and mobility of heavy metals are greatly favoured by low soil pH (Osakwe, 2014).

2.2 Total Organic Carbon (TOC)

Tables 1-3 showed the values for the monthly determinations of Total Organic Carbon. Station 2 has a percentage TOC range of 3.51- 4.21 with a mean value of 3.714. Stations 2 and 3 have values ranges of 3.19 – 4.43 and 3.33 – 4.41 respectively and mean values 3.347 and 4.031 respectively. Table 4 showed that Station 2 has the lowest TOC value of 3.347 while Station 3 has the highest TOC value of 4.03. It is observed from the result that TOC values of auto mechanic workshop 1 and 3 are within the same range and TOC values of auto mechanic workshop 2 was in another range. The mean %TOC of the three (3) auto mechanic workshops, ranges from 3.347 to 4.031 with a mean value of 3.697 ± 0.279 . These values are higher than those published by Akpoveta et al. (2010) and lower than those by Osakwe (2014), but fall within the range of the result presented by Olayinka et al. (2017). However, TOC values across the five auto mechanic workshops are relatively higher than that of the control and this by implication shows that the activities of these workshops which involve discharge of spent oil, among others may have contributed to the significant increase in the level of the TOC in the study areas. This suggests the presence of degradable and compostable substances and thus,

increase in microbial activities in the soils.

2.3 Total Organic Matter (TOM)

Tables 1 – 3 present six monthly determinations for %TOM of soils across the 3 auto mechanic workshops. Station 1, Station 2 and station 3, have %TOM value ranges of 6.10 – 6.71, 6.33 – 6.93 and 6.65 – 7.24, with a mean values of 6.403, 6.632, and 6.949 respectively. From the results obtained in the Table 4, Station 3 has the highest value of TOM with a mean of 6.949 and Station 1 has the lowest value with a mean of 6.403. Comparing the results from the Tables TOM of the three auto mechanic workshops has a range of 6.403 – 6.95 and a mean value of 6.661 ± 0.224 . These values are in agreement with results published by Pam et al. (2013), Sadick et al. (2015), Olayinka et al. (2017) in similar studies.

The results when compared with that of the control, it shows that the values obtained are all relatively higher than that obtained from the control site. This by implication suggests that the elevated level of TOM in soil around the workshops under study may have emanated from the activities carried out on daily basis in the workshops. Akan et al. (2013), stated that Carbon-based matter plays important role in metal binding. Brummer and Herms (1982), explain that carbon-based matter immobilizes heavy metals at strongly acidic conditions and mobilizes it at weakly acidic to alkaline reactions by forming insoluble or soluble carbon-based metal complexes respectively.

2.4 Total Nitrogen

Tables 1-3 present percentage total nitrogen of the three monthly determinations for the three auto mechanic workshops. The values ranges from 0.16 to 0.19 in Station 1, 0.18 to 0.20 in Station₂, 0.19 to 0.21 and Station₃, with mean values of 0.186, 0.193 and 0.202 respectively. The values of the three auto mechanic workshops varied between 0.16 and 0.21 across the three locations with a mean value of 0.19 ± 0.006 . The results obtained shows that Station 2 has the highest value while Station 3 has the lowest value. When comparing the result obtained from soils around the three auto mechanic workshops with that of the control site, it is found that the values for the workshops were all higher than that of the control site, and the significant increase in %TN of the soils around these workshops could be attributed to the activities carried out in these workshops. These values are relatively lower than those published by Osakwe (2014) in related research study.

2.5 Phosphorus

The results obtained in Tables 1 - 3 presents the percentage of phosphorus in six determinations for the period of three months. The results showed that Station 1 have value ranges of 4.16 – 4.77; 4.77 – 5.03 in Station 2 and 3.18 – 3.22 in Station 3 with mean values of 3.872, 4.907 and 3.198 respectively. From the results, it shows that Station 2 has the highest phosphorus content while Station 3, the lowest. The summary of the determinations across the three auto mechanic workshops shows value ranges from 3.198 to 4.907 with a mean value of 3.992 ± 0.703 . Comparing the results of the soil around the three auto mechanic workshops and that obtained from the control site, and it is observed that the values for auto mechanic workshops 1, 2 and 3 are all lower than that of the control.

2.6 Electrical Conductivity

Tables 1 – 3 presents the results of electrical conductivity of soil from the three auto mechanic workshops for six determinations. From the results obtained, Station 1 has value ranged from 86.23 to $86.61 \mu\text{S}/\text{cm}$ and a mean value of $86.43 \mu\text{S}/\text{cm}$. Station 2 has value ranged from 87.38 – 97.89

$\mu\text{S}/\text{cm}$ and a mean value of $92.89\mu\text{S}/\text{cm}$. Station 3 has a value ranged from 101.70 to $105.40\mu\text{S}/\text{cm}$ with a mean value of $103.63\mu\text{S}/\text{cm}$. It is observed from the result that Station 1 has the lowest EC value of $86.43\mu\text{S}/\text{cm}$ while Station 3 has the highest EC level of $103.6\mu\text{S}/\text{cm}$. From the Tables, the value ranges across the three stations varied from 86.43 to $103.63\mu\text{S}/\text{cm}$ with a mean value of $94.32\pm 7.09\mu\text{S}/\text{cm}$. Comparing the results of the soils across the three auto mechanic workshops and that of the control site, it was observed from the figure that the electrical conductivity values across the three auto mechanic workshops were all higher than that of the control site, and by implication, the high electrical conductivity values in these soils is attributed to the presence of the workshops in the area under study.

There was no significant difference from anthropogenic inputs of auto-mechanic workshops, $t(5)=0.32, p=.379$, despite mechanic workshops ($M=19, SD=1367$) having higher values relatively than the control ($M=13, SD=609$). Similarly, one-way ANOVA showed that the result was not significant at $p<.05$ across the three study stations of 1, 2 and 3 (f-ratio of 0.00932; p-value of .990733). This does not mean that the relative values were not different.

5.0 CONCLUSION

The soil is very crucial to all living organisms and serves as natural sink for anthropogenic wastes. Indiscriminate dumping of wastes pollutes and changes the soil physicochemical properties thus, degraded its value and reduce its usage. The study evaluated the physicochemical properties of surface soil around three auto mechanic workshops in Bori and environs. The results of the analysis revealed that the mean concentrations of the studied physicochemical parameters were all higher than that of the control sites except for phosphorus, %sand and %silt. This is an indication that the significant increase in concentrations of the physicochemical parameters is a direct consequence of the activities of the auto mechanic workshops. Auto mechanics and artisans should therefore be enlightened on the health consequences associated with dumping of their wastes indiscriminately why proper waste disposal methods should be encouraged. Authorities of the urban and regional planning should live up to their responsibilities by ensuring that auto mechanic workshops and mechanic villages be sited far from residential home. Laws restricting establishment of auto mechanic workshops indiscriminately should be enacted followed by implementation and enforcement to check the level of compliance.

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PREVALENCE OF INTESTINAL PARASITIC INFECTION AMONG SCHOOL CHILDREN AGED 5-12 YEARS IN COMMUNITY PRIMARY SCHOOL GURE, KHANA LOCAL GOVERNMENT AREA, RIVERS STATE, NIGERIA

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Abstract

Intestinal parasitic infections are more prevalent among the poor sections of population. They are closely associated with low household income, poor personal and environmental sanitation, overcrowding, limitation and access to portable clean water, tropical climate and low altitude. Intestinal parasitic infections are the top global health problems whereas *Ascariasis*, hookworm, *Trichiuriasis* infections and *Amoebiasis* are among ten most common infections. The purpose of this study was to access the prevalence of intestinal parasitic infection among school children aged 5-12 years in Community Primary School Gure, Khana Local Government Area, Rivers State, Nigeria. This study was undertaken in Gure community from January to June, 2019. A total of 100 stool samples were randomly obtained using standard procedures and examined for the presence of parasites. The population for this study was children between 5-12years. A formal consent was obtained from the parents of each child/ward. The laboratory techniques involved aseptic collection of stool samples following standard quality procedure. Simple percentage was used for statistical analysis. Out of the total number examined, 10(10%) were found to be infected with one or more of the intestinal parasites. It also showed that out of the 10 positive samples, *Ascaris lumbricoides* was the most predominant:9(90%) and *Trichuris trichiura* was the least prevalence: 1(10%) Also, male children were more infected than the female children with 6(60%) and 4(40%) respectively. Statistically, it shows that 8(80%) of 5-8yearschildren were infected and 2(20%) of 9-12years children were also infected. Furthermore, intestinal parasitic infection was more prevalent in primary 1 3(30%), followed by primary 2 & 4 2(20%) and primary 3, 5 & 6 had the least prevalence 1 (10%). Intestinal parasite is highly prevalent in this study area. The study concluded that provision of potable drinking water, adequate sanitary facilities, public education on personal hygiene and de-worming programme should be conducted in primary schools to reduce the prevalence of intestinal parasitic infections.

Keywords: prevalence, parasitic, intestinal infection, school children

INTRODUCTION

Intestinal parasitic infection represents a large and serious medical and public health problem in developing countries. Intestinal parasites are endemic worldwide and have been described as constituting the greatest single worldwide cause of illness and disease. Human parasites are common in developing countries and are of major health challenge because of their high prevalence rate and their effect on both nutritional and immune status of the population. Parasitic disease of blood and gastro - intestine of human are rampant in the tropics because of favorable climatic environment and socio-cultural favours which permit transmission of these parasitic diseases (Alli et al., 2011).

Mordi and Ngwido, 2007; Intestinal parasite reside in the human gastro - intestinal tract, they represent one of the most prevalent and infectious form of parasitic disease. Humans are host to nearly 300 (three hundred) species of protozoa and some are acquired from animals (Odu et al., 2011). They consist of members of the following: Nematodes (Round worms), Cestodes (Tape worms), and Trematodes (flukes). Parasites often find their way into a host through contaminated food or water, soil and even sexual acts. Poorly washed vegetable eaten raw may contain eggs of nematodes such as *Ascarislumbricoide*, *Enterobiusvermicularis*, *Trichuristrichiura* or Cestodes such as *Taenia*, *hyrnenolepis nana* and *Echinococcusgranulosus*. Plants may also be contaminated with fluke *Metacercaria (Fasciola)*. These parasitic diseases, whether water born, vector borne, soil transmitted or those that result from poor sanitary or social habits (Alli et al., 2011; Mordi & Ngwodo, 2007).

The most infection and prevalent Neglected Tropical Disease (NTDs) are *Ascaris*, *Trichiairiasis* and Hookworm infection including helminths, lymphatic, filariasis, soil transmitted *helminthiasis*, *schistomiasis* and food borne trematode infection (Odu et al., 2011). The parasite frequently encountered includes; *Ascarislumbricoides*, *Hookworms*, *Trichuristrichiura*, *Sirongloidesstercoralis*, *Giardia lamblia*, *Enterobilisvermicztlaris*, *Ancylostoinathiodenale*, *Necatoramericanus* (Odu et al, 2011; Awolaju & Morenikeji, 2009). Infections are important factors contributing to malnutrition in this age group (5 - 8years) (Odu et al., 2011; Stephenson et al., 2000). Estimates of these parasitic diseases thus become a matter of necessity for the surveillance of public health proper health care delivering and people welfare (Mordi & Ngwodo, 2009).

Research Questions

1. What is the prevalence of intestinal parasites amongst primary school pupils in Gure Community Primary School based on age.
2. What is the prevalence of intestinal parasites amongst primary school pupils in Gure Community Primary School based on gender.
3. What is the prevalence of intestinal parasites amongst primary school pupils in Gure Community Primary School based in respect to class

Materials and methods

This cross sectional experimental study was carried out in Community Primary School, Gure in Khana Local Government Area of Rivers State, Nigeria. Khana is one of the largely populated local government areas in Rivers State and its headquarter is Khana. The study population comprised of school aged children between 5-12 years. Random sampling technique was adopted in this study. However, non probability sampling approach was utilized in selection of study area and population. A written and informed consent was obtained from each parents/gaurdiance. In the laboratory procedure, stool samples were aseptically collected following the standard quality procedure according to Chessbrough (2006). Statistical data were analyzed using simple percentage for the results.

RESULTS

Demographics and Study Participants

This study consist of 100 (hundred) stool samples which were collected randomly from the primary school pupils in their various classes. The samples were transported after collection and examined in the Medical Laboratory Service Department of Rivers State College of Health Science and Management Technology the next day with good preservation. A total number of 41 stool samples were from the females while 59 samples were from the males. The result shows that 10(10%) of the primary school pupils were found to be harbouring intestinal parasites of which 6(60%) of the male

have the highest prevalence and 4(40%) of the female were also infected. The two intestinal parasites discovered were *Ascarislumbricoides* 9(90%) and *Trichuristrichiura* 1(1 0%). From the percentage above, it can be seen that *Ascarislumbricoides* had the highest prevalence, followed by *T. trichiura* with the least prevalence.

Table 1: Prevalence of Intestinal Parasites in Relation to Sex

Sex	Pos (%)	Neg (%)	Total
Male	6(60%)	35(38.9%)	41
Female	4(40%)	55(61.1%)	59
Total	10	90	100

Table 1 shows that out of 100 children examined for intestinal parasites, 10 were positive: 6 (60%) were males and 4 (40%) were females. The remaining 90 was negative. There is no significant difference between the male and the female.

Table 2: Prevalence of Intestinal Parasites in relation to Age

Age	No. Examined	<i>Ascaris lumbricoides</i>	<i>Trichuris trichiura</i>	Total (%)
5-8	59	7(77.8)	1(100)	8(80)
9-12	41	2(22.2)	0(0)	2(20)
Total	100	9	1	10

Table 2 shows a total number of 100 stool samples which was collected from community primary school children. 10 of the samples was positive for the intestinal parasites of which 9(90%) were *A.lumbricoides* has the highest prevalence and 1(10%) was *T.trichiura*. while 90 of the stool samples were negative.

Table 3: Prevalence of intestinal parasite in relation to their classes

Class	Total No. Examined	No. Infected (%)	No. Not Infected
Basic I	20	3(30)	17
Basic 2	15	2(20)	13
Basic 3	15	1(10)	14
Basic 4	20	2(20)	18
Basic 5	15	1(10)	14
Basic 6	15	1(10)	14
Total	100	10	90

Table 3 shows that 100 stool samples were collected from Community primary school Gure pupils in their various classes. 10 (10%) were infected and 90(90%) were non-infected. Basic 1 has the highest prevalence of intestinal parasite of 3(30) followed by Basic 2 & 4, 2(20%) each, and Basic 3, 5 & 6 had the least prevalence with 1(10%). Hence, all the classes were infected at least with one intestinal parasite.

Discussion

The study shows the overall prevalence of *Ascarislumbricoides* 9 (90%) and *Trichuristrichiura* 1 (10%) infection among school pupils in community primary school Gure, Khana Local Government Area, Rivers State, Nigeria. The occurrences of intestinal helminthiasis due to the trial of *A. lumbricoides* and *T. trichura* as observed in this study was also reported by various authors such as Sowemino and Asaolu (2011), Adeoye et al. (2017) and Ugbomiko et al. (2016). The prevalence of *Ascaris lumbricoides* infection is higher than other intestinal parasitic infections which is consistent with the report of Adeyeba et al. (2005). It was higher when compared with 75.8% reported by Emmanuel et al. (2017). Although the findings of this study were somehow lower when compared with 95% reported by Gabkima and Sahr (2010). The high prevalence of *Ascaris lumbricoides* infection may be attributed to high level of unhygienic practices among the pupils which enhanced the transmission.

The study found that intestinal parasites were more prevalent among male school children 6(60%) than the female 4(40%). This is an indication that the two genders are not equally exposed to infection. In agreement to the findings of this prevalence was also supported by Kiram (2009) who found that intestinal parasites were more prevalent among the male (59%) than the female (41%) respectively. In this study, it was found that children between the ages of 5-8 had the highest prevalence of intestinal parasitic infections compared with the other age group. This finding gained support from a study conducted by Hussien et al. (2017) who reported 77.8% and 22.2% for 5-8 and 9-12 years old and Adanyi et al. (2011) who reported lower prevalence in age 9-12 and higher prevalence for children below age 9 years.

The study went further to analyze its findings based on their classes, the observation were as follows; Basic 1, 3(30%), Basic 2. 2(20%), Basic 3, 1(10%), Basic 4, 2(20%), Basic 5, 1(10%) and primary 6, 1(10%). The findings further indicated that Basic 1 had the highest infection prevalence followed by Basic 2& 4 and lastly primary 3, 5 & 6 with 1(10%). The presence of *Trichuristrichiura* infection in the study area was not unexpected since it is known that similar conditions influence the endemicity of *Ascarislumbricoides* (O' larcaín & Holland, 2000). It is also known that *Ascarislumbricoides* infections are rarely found alone in human communities (Crompton, 2002). Furthermore, occurrence of intestinal parasites infection in the area was not unusual in the study area, because of poverty, Ignorance, low sanitation. Poor water treatment (Okolie, 2008). This study reveals that the risk factors and prevalence of intestinal parasites in the school was generally low. There were known significant difference in the relevance of parasitic infection among the school children.

The clinical features associated with intestinal parasites are nausea, abdominal pain, flatulence, mucus, constipation and bloody stool. However a considerable number of cases remain subclinical. The intestinal parasitic infection recorded by this study therefore synchronizes with the overall prevalence of intestinal parasites in the study area due to the level of sanitation and economic status of the inhabitants.

Conclusion

This study examined the prevalence of intestinal parasites among school children aged (5-12) years in Community primary School, Gure, Khana, Rivers State, Nigeria. The study has successfully

achieved the objective for which it was set. The finding of this study has shown that two intestinal parasites were prevalent among the study group which are *A.lumbricoides* 9 (90%) and *Trichuristrichiura* 1 (10%). Among the two found intestinal parasites, *Ascarislumbricoides* was the most prevalent while *Trichuristrichiura* was the least prevalent.

Recommendations

1. Therefore, environmental sanitation and personal hygiene programs be maintained in schools and communities so that other schools can emulate from them
2. The pupils could be used as co-educators to educate other pupils on education and food hygiene.

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COVID-19 PANDEMIC AND TECHNOLOGIZATION OF EDUCATION IN NIGERIA

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Abstract

The outbreak of COVID-19 and its subsequent declaration as a public health emergency of international concern by the World Health Organisation (WHO) brought about the closure of schools as part of the measures to check and control the spread of the virulent and deleterious disease. This resulted in the abrupt closure of schools, and the adoption of alternative modes of instruction to ensure that teaching and learning did not stop completely during the pandemic. Technologization of education or educational technology was employed by way of electronic or mobile learning, zoom, radio and television broadcasts, and so on. The study adopted the qualitative (non empirical) research method to critically examine the application of technology to education during the COVID-19 pandemic, and it's implication for education in post COVID-19 era. The paper observed that technologization of education did not go unencumbered in Nigeria as it was fraught with multifaceted challenges ranging from dearth of infrastructure and technological facilities, lack of requisite and qualified Information Communication Technology personnel, unreliable power supply, lack of quality Internet services and broadcast signals, among others. In view of the enormous benefits inherent in the technologization of education even in the post COVID-19 era, it was recommended that government and private organisations invest resources in the area of educational technology, and that a strong policy in that regard should be formulated with a view of ensuring that it is implemented fully.

Keywords: COVID-19 pandemic, education, technologization of education

Introduction

The year 2020 would not be forgotten in a hurry because of the COVID-19 pandemic that ravaged the whole world. It started like a small fire lit in Wuhan province of China where a novel strain of the corona virus named COVID-19 was discovered. It spread like wide fire to every part of the world, leaving in its trail high rate of hospitalizations and deaths, and brought every facet of life to a standstill. It altered the way we live and interact with others as preventive measures such as social distancing, confinement, use of facemask, closure of schools, business and public places, lockdown, etc., were put in place. There has been concerted effort globally to provide pharmaceutical intervention as evident in the number of vaccines rolled out so far. In the interim, we have to live with the consciousness of the existence of the disease and its virulent nature.

COVID-19 has had tremendous impact on education worldwide, but its effects appear to be more pronounced in the underdeveloped countries like Nigeria. There was disruption of the academic calendar, suspension of physical learning activities and the adoption of alternative methods of instruction which relied principally on technology. Hence, the application of technology became the order of the day as its use transcended the education sector. This paper tries to caste a cursory look at the application of technology to education, and its implication for education in Nigeria in the post COVID-19 era.

Conceptual Clarification

To ensure better and clearer comprehension of the topic of this discourse, the cardinal concepts that underlie the topic would be contextually analyzed. The concepts are COVID-19, education, and technologization of education.

The Concept of COVID-19

COVID-19 is the name given by the World Health Organization (WHO) on February 11, 2020 to the disease caused by a strain of coronavirus called severe acute respiratory syndrome virus 2 (WHO, 2020a). The disease was first recorded in the city of Wuhan in the Hubei province of China (WHO, 2020b). It is an acronym for coronavirus disease of 2019. The choice of the name was hinged on two reasons: firstly, to ensure it makes no reference to the place the disease originated from, animal or people; and secondly, for easy pronunciation.

While the disease was spreading at a fast rate, the whole world was gradually grinding to a halt as efforts were instituted to reduce or possibly stop its spread. With its declaration as a Public Health Emergency of International Concern (PHEIC), national lockdown was imposed in Nigeria and lifestyle modifications such as social distancing, use of hand sanitizers and face mask were advocated as non pharmaceutical preventive measures. Nigeria as at the end of August, 2021 had 2,7179,723 test cases, 192,431 confirmed cases, and 2,469 deaths (NCDC, 2021). The symptoms of the disease are fever, cough, shortness of breath and pneumonia, and its modes of transmission are through contact with respiratory droplets from infected persons and touching contaminated surfaces (Bender, 2020).

The Concept of Education

Attempts have been made variously by scholars to define the term “education”, thereby giving it so many denotative and connotative meanings (Nwafor, 2008). Hence education is regarded as an elusive slippery and contentious concept that has defied a single universal definition. This is because education according to Aggarwal (2002), behaves like a diamond that assumes different colours depending on the angle from which it is viewed. For Nwafor (2016) education can be likened to a chameleon that takes on the colour nearest to it because different societies could perceive education in different ways. Therefore the different definitions of education arose as result of the dynamic nature of education, the complexity of human nature and environment, and the different periods of intellectual development.

Education is as old as human existence and it distinguishes man from animals (Olasheinde-Williams, 2018). No society can do without it because of its overarching importance in the development of the society. According to Fafunwa in Nwani and Meshack (2014), education is the entirety of the activities that are geared towards enabling younger members of the society develop attitudes, abilities and behaviours which the society values and upholds. This would enable members of the society to function and play their roles effectively. It is on this basis that education is regarded as a sine qua non for societal function, change and transformation (Magaji, 2014). Hence the development of any nation is premised on the positive transformation of members of the society who collectively contribute to the development of the society or nation.

Technologization of Education

The concept “Technologization of Education” in modern teaching literature is synonymous with “pedagogical technology”, “educational technology” and “Teaching Technology”, and it is simply the technological approach to education (Ignatyeva, 2015). It has to do with application of techniques and technology that change the complexion of the traditional education approach. It is a process that involves the teachers and the learners, and how they make use of technology to improve the learning process (Pachler, Cook & Bachmair, 2010). Technologization of education include the use of information communication technology (ICTs) such as computers, smart phones, radios, television, internet, etc., which have constituted a significant means of transmitting knowledge, through electronic or e-learning, mobile or m-learning, blogs, social networks, etc. Hence it has encouraged learning without having the teacher and the learners physically present in an enclosed

physical classroom, but virtually. Its importance in the education process cannot be overstressed as it eliminates limitations contingent on time, distance and space, and helps to increase educational attainment and literacy.

In recognition of the importance of technology in education, the National Policy on Education stressed the need for media houses and information technology to work towards achieving the kind of education that does not require physical contact between teachers and learners (FRN, 2013). Unfortunately, its actualization has remained a mirage as appreciable progress has not been made in this regard.

Effects of COVID-19 on Education in Nigeria

The outbreak of COVID-19 and the efforts to check its transmission had the following profound impacts on education in Nigeria.

- 1. Disruption of academic calendar:** The academic calendar for the lower tiers of education in Nigeria had remained relatively stable and uniformed across the country prior to the outbreak of the global pandemic. But the closure of schools in order to control the spread of the disease has altered this balance significantly, and the Federal and State Ministries of Education are still battling to restore the status quo. Presently, pupils are supposed to be rounding off their long vacation holidays, but the reality is that some schools are yet to vacate for third term. This has also affected the calendar for the senior secondary and basic education certificate examinations.
- 2. Shallow coverage of the curriculum:** Adequate implementation of the curriculum is non-negotiable for education to be meaningful and effective (Pandey, 2018). This requires conscious execution of the curricular and extra-curricular activities for a particular class by the teacher. The achievement of this has been extremely difficult, if not completely impossible because in a bid to observe covid-19 protocols such as social distancing, the class size has been downsized and the number of periods for every subject reduced. This would create a situation where the learners would move to the next class without covering substantial percentage of the previous class curriculum. Such situation would obviously pose challenge to the learner and the teacher in the next class.
- 3. Psychological effect:** The closure of schools made students develop psychological or mental conditions due to deprivation of money for upkeep and their inability to participate in online lectures as a result their inability to afford the requisite facilities (Uddin & Uddin, 2021). This would manifest in the form of anxiety, depression, stress, low quality of sleep, and in extreme cases result in suicide.
- 4. Decreased access to education:** The whole world, Nigeria inclusive, has been talking of attaining equal access to quality education, when suddenly COVID-19 threw a spanner in its wheel of progress. Some families lost their sources of livelihood during the economic downturn occasioned by scourge. This resulted in the inability of some children to resume schooling, while some dropped out of school completely. The use of alternative methods of instruction during the peak of the pandemic also robbed some students of the benefits of education as the facilities for such instruction were lacking, or as a result of unreliable internet services and transmission signals. This has not only decreased the access to quality education, but also increased the educational disparity between the children of upper and lower classes of the society.

Benefits of Technologization of Education in Post COVID-19 Pandemic

The application of technology to education would of immense benefit during and after the COVID-19 pandemic in the following ways:

- 1. Equalization of Educational Opportunities:** Equalization of access to educational opportunities has remained a burning issue of both local and international interest. Unfortunately, educational imbalance in Nigeria has been an issue before and after independence. This situation is however contrary to the provision of National Policy on Education that every citizen be provided equal and qualitative educational opportunities (FRN, 2013). The efforts put in place during the pandemic, if improved and sustained, would go a long way in actualizing this policy provision. It would enhance the quality of education at the disposal of the learners, thereby reducing the differences in education achievement which usually occur as a result of differences in family background, geographical location or socio-economic status.
- 2. Flexibility of Learning:** The application of technology to education has made it possible for technology and learning to go without the primary actors being in contact with one another. This makes the learning process flexible because the learner is at liberty to choose when, where and how learning should take place (Robert, 2013). This eliminates some of the impediments the learner would have faced in a physical classroom and improves learning outcomes.
- 3. Enhancement of Educational Outcomes:** The overarching impact of educational technology would be seen in the quality of the products of the educational system. This would bring about the development of members of the society by equipping them with skills, abilities and attitudes that would enable them work and live in the society as responsible citizens. The overall effect of this is that it would engender sustainable national development as a result of the collective contributions of individuals who have benefitted from the application of technology to education.

Challenges of Technologization of Education

The application of technology to the education process is inevitable, because of its numerous benefits. However, its implementation has been fraught with some challenges which include:

- 1. Lack of Physical Contact:** Education in the traditional sense involves both the teacher or instructor and the learners being physically present in the same classroom. This makes for face-to-face interaction between the teacher and learners. It enables the teacher to have a firsthand knowledge of psychological disposition of his students and devise means of structuring and adapting the lesson to meet the educational needs of every child. This would be extremely difficult if not utterly impossible, especially when radio and television are used as medium of instruction. The implication of this is that lack of physical contact between the teacher and learners may not make for individualized instruction and meaningful learning.
- 2. Lack of ICT Units and Resources:** Technologization of education requires the use of ICT equipment such as computers, smart phones, radios, television, and functional ICT units that would ensure the optimal functioning of these gadgets. Most of this technological equipment are expensive, as a result not many families with children of school age can afford them (Eze et al., 2021). Hence it becomes practically impossible for home schooling or distance learning to take place. Again, these gadgets require the availability of skilled and proficient ICT personnel, but this is almost non-existent just as there are hardly ICT units in most public primary and secondary schools in Nigeria.
- 3. Power Outage and Connectivity Network Fluctuations:** Virtually every technological equipment needed for technologization of education requires a reliable source of power for its function. As reported by Ukaimo and Ekwe (2019), in 2015 Nigeria was ranked highest among countries with deficit in electricity access because about 75 million Nigerians did not have

access to power. That little or no improvement has been recorded in electricity generation since then means there would not be adequate power supply for those able to afford the electronic gadgets for education. This situation is more pronounced in the rural areas where lack of connection to the national grid is a common sight, and the inhabitants are unable to acquire personal generating sets because of their low purchasing power. Again, there is low presence of digital connectivity in Africa, especially in the rural areas (Friedesici et al., 2017). The absence of or low quality telecommunication signals would result in lack of connection or fluctuation in signals which could hinder learning. This contributes to widening to educational gap between the urban and rural area dwellers.

4. **Unamenable to Change:** The application of technology to education is not only novel but unorthodox to the traditional notion of education. The introduction and adoption of new ways of doing things is encumbered by resistance and negative attitude of the users of the new technology (Skoumpopoulou, 2018). There is the utmost need for every stakeholder in the education sector to be sensitized and adequately informed of the unquantifiable benefits of educational technology for technologization of education to be effective and productive.
5. **Ineffective Policy Implementation:** The National Policy on Education provides for the application of technology in education sector as a means of increasing access to quality education through the utilization of ICT, (FRN, 2013). This lofty policy statement has achieved very little or nothing in that regard because the Nigerian information Communication Policy according to Ibara (2014), did not make sufficient provision for the integration of ICT in the education system. This in a nutshell has robbed the education process of the benefits of technology, thereby making access to quality education difficult.

Implications of Technologization of Education

We have examined some of the benefits of the application of technology to education and the challenges associated with it. It also has some implications which include:

1. **Reduction of interaction with peers and instructors:** Educational technology drastically reduces a learner's interaction with his peers and the teacher (Fu, 2013). This is contrary to the doctrine of social learning which posits that observation and imitation play crucial roles in the learning process. As observed by Hurst, Wallace and Nixon (2013), effective classroom interaction improves students' language performance and enables the teacher improve the teaching process. The application of technology robs the teacher of the benefit of feedback which is necessary for effective instruction.
2. **Financial Implications:** The application of technology comes with some financial implications for the learner's family and the managers of the sector. Families with low purchasing power and those in rural areas may not have the finance to procure computers, smartphones and educational softwares needed for learning. This is largely responsible for the digital divide prevalent in Nigeria. Education administrators are also faced with the challenge of acquiring and maintaining computers and internet facilities. This situation is worsened by the pervasive economic down turn and poverty in the country.
3. **Distraction:** Information and communication gadgets used in education could become sources of distraction or may be put to wrong use (Olaore, 2014; Fasiku, 2014). Students could take on line gaming, chatting or watching of videos and advertisements, thereby defeating the essence of the application of technology to education. Lack of parental supervision in the utilization of these gadgets could create room for them to be used to perpetrate internet fraud.

Conclusion

The unanticipated outbreak of COVID-19 in 2019 and its deleterious effects on man, resulted in modification to the traditional ways of getting things done, in a bid to control and stem the spread of the scourge. The education sector was not spared of these effects as it witnessed abrupt closure of schools and disruption of the academic calendar. This necessitated the use of alternative approaches to learning such as electronic/internet learning to ensure that the education did not stop completely during the pandemic. This exposed or reinforced the dearth of facilities and support system needed to implement online learning successfully, thereby increasing the yawning gap in educational attainment. Hence the outbreak of COVID-19 could be seen as a blessing in disguise for education in Nigeria, because it brought to the fore the gross deficit in educational technology. Addressing this ugly trend, would make for an improved education sector especially in the post COVID-19 era. Therefore, technologization of education should be one of the cardinal education policy thrusts of governments at all levels as it would enhance the quality of the graduands and drive socio-economic and political development of Nigeria to a higher pedestal.

Recommendations

In view of the enormous benefits inherent in the adoption of technology in education, the following recommendations would be proffered in order to address the absence or inadequacy of the application of technology to education in Nigeria:

1. A review of relevant policies on education and ICT, to come up with a holistic policy that would ensure the integration of ICT to the education process. This would go a long way improving the application of technology to education.
2. Government should show genuine commitment and efforts towards the provision of technology and ICT facilities and equipment for every school, teachers and learners by improving the annual budgetary allocation to meet the 26% UNESCO threshold.
3. Human resource development by way of constant training and workshops, so as to ensure that the ICT facilities are put to use effectively. It would also ensure that stakeholders in the education sector, especially teachers, are abreast with the time, advancements and innovations in pedagogy.
4. Development of post COVID-19 pandemic curriculum that would address some educational issues thrown up by the disease, because education as a dynamic concept should be able to meet the contemporary challenges of the society.

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DOMESTIC WASTE MANAGEMENT AND COVID-19 PANDEMIC IN RIVERS STATE

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Abstract

The challenge posed by COVID-19 on poor waste management system in Rivers State calls for concern. Hence, the study investigated the management of solid waste in COVID-19 pandemic. A self structured questionnaire was administered to 256 households/respondents and data recovered were analyzed statistically and presented in percentages. Results on type of waste generated revealed food debris, bottles, ashes, cans, nylon and sanitary wastes had 93%, 75%, 82%, 80.5%, 75.8% and 1.2% positive responses respectively, while the respondents' disposal methods were: open dumping (99.2%), burying (43.4%), land filling (40.2%) and burning (60.5%). Other disposal methods employed are: composting and incineration methods with a disposal percentage of 0.8% and 0.0% respectively. Disposal of waste in bushes and river were noted 88.7% and 39.1% respectively. The high food wastage indicates environmental pollution and health risk and thus, open burning and throwing of waste inside bushes releases toxin into the environment which could encourage secondary transmission of diseases to human. The study concludes that COVID-19 should be an early warning signal for prompt measure on waste management for a healthy environment. Hence, households should ensure they follow emission requirements, so as to avoid secondary health impacts.

Keywords: domestic waste, waste management, COVID-19 pandemic

Introduction

The emergence of COVID-19 once again exposed the poor waste management system in Rivers State, Nigeria. The COVID-19 disease is a disease of man that affects the respiratory tract, caused by a virus named; Corona Virus (Akintunde et al., 2020). COVID-19 was first reported in Wuhan, China and it spread to all Continent/Nations of the World affecting a high population of the human race daily (Qu et al., 2020). The Corona Virus has a three (3) hours life span in the air and as part of aerosols, when deposited on solid waste surface, survives a longer time. Consequent upon these, Kamp et al., (2020) reported that surfaces of wastes are of tremendous concern in the spread of diseases. Following COVID-19 pandemic out-break and wild spread of Corona Viruses, huge volumes of waste (that could be infected with the virus) have been observed generated daily (Andersen, 2020) without adequate form of management, raising concern on inhabitants and the environment (Olowoporoku, 2017). Waste management is critical to human development and health outcome especially during the Covid-19. Waste management has been affected by increased human population, poor sanitary behavior and inadequate environmental amenities among others (Moore, 2007). These factors which are associated with poor waste management have resulted to uncollected piles of solid/domestic waste (Kamran, 2008) consisting of personal protective equipment (PPE), nose/face mask, bottles, medical consumables and other wastes (Kamp et al., 2020). Poor waste management practices opens-up for human scavengers, the potential to re-use or recycle some waste materials which might be associated with COVID-19 debris. Thus, this re-use practice in-turn may encourage the spread of COVID-19. Hence, improved waste management is

fundamental to health and disease prevention (Water Aid, 2019). To mitigate the spread of COVID-19, the management of waste in Covid-19 pandemic calls for concern. Hence, the study is aimed at examining associated waste recovered and the management strategy employed, as this could be an early warning measure in the battle against COVID-19.

The Study Area

The study area chosen for the study is the Rumueme Communities of Obio/Akpor Local Government Area of Rivers State. The Area has a household population of 59,820 persons. The study area was partially hit by the Corona Virus spread, with confirmed recorded recovery and death cases. The Government however, responded swiftly by instituting a lock down of the economy and further provided isolation camps.

Study Design/Administration of Questionnaire

A self-structured questionnaire titled COVID-19 pandemic and waste management was administered to 256 households/ respondents to elicit closed ended responses of yes or no. Data retrieved from the respondents were coded into statistical package for social science and analyzed using descriptive statistics of percentage.

Result

Table 1: Respondents Report on Type of Waste Generated

S/No	Type of Wastes	Yes Response F (%)	No Response F (%)
I	Food Debris	238 (93.0)	18 (7.0)
Ii	Bottle	191 (75.0)	15 (7.4)
Iii	Ashes	210 (82.0)	46 (18.0)
Iv	Cans	206 (80.5)	50 (19.5)
V	Nylon/Sac Bags	194 (75.8)	62 (24.2)
Vi	Sanitary	3 (1.2)	238 (98.8)

Respondents Report on Type of Waste Generated

Table 1, shows the demographic information of respondents on the type of waste generated from households under study during the COVID-19 pandemic. Food waste had a waste generated rate of 93% , followed by bottle waste with 75%. Ash, Can, Nylon and Sanitary wastes had 82, 80.5, 75.8 and 1.2% generated waste respectively.

Table 2: Disposal Methods of Waste Generated

S/No	Waste Disposal Methods	Yes Response	No Response
		F (%)	F (%)
I	Open dumping	254 (99.2)	2 (0.8)
Ii	Burying	111 (43.4)	145 (56.6)
Iii	Land filling	103 (40.2)	153 (59.8)
Iv	Throwing inside a nearby river	100 (39.1)	156 (60.9)
V	Throwing inside a nearby bush	227 (88.7)	29 (11.3)
Vi	Burning	155 (60.5)	101 (39.5)
Vii	Composting process	2 (0.8)	254 (99.2)
Viii	Incineration method	0 (0.0)	256 (100)

Disposal Methods of Waste Generated

Table 2 showed the disposal method or strategy employed by the households/respondents during the COVID-19 pandemic. Open dumping practice was employed at a 99.2% rate, while burning of waste was observed by 43.4% of the households. Land filling method was practiced by 40.2% of the household. 88.7% households threw their waste in nearby bushes, while 39.1% threw their waste in nearby Rivers. Burning, incineration and composting methods were practiced by 60.5, 0.0 and 0.8 % of the households respectively.

Discussion

There is currently no evidence that people can catch COVID-19 from food. Corona virus, like other viruses can be killed at a high temperature. However Corona Virus dies very quickly when exposed to ultra-violet light. The study reported a high percentage of food waste deposits amongst other waste investigated. This shows that food wastage is becoming a critical problem around the globe due to continuous increase of world population. Consequently, the exponential growth in food wastage is imposing serious threat to our society like environmental pollution and health risk according to Paritoh et al., (2017).

In other waste generated, sanitary waste was the least. The least presence of sanitary waste as reported in this study may be appropriate as reported by UNICEF (2020) that sanitary waste generation were significantly high in health care facilities in the pandemics. To this effect, UNICEF (2020) report, hand washing with soap and water as practiced in the pandemics, contributed no solid waste but liquid waste. Thus, other sanitary wastes were not pronounced. Of the total amount of waste generated by households, about 96% wear generally non-hazardous. That is to say 4% of the waste generated wear hazardous.

On the issue of waste management in the homes, open burning and throwing of waste inside bushes were mostly, practiced by households/respondents as a method of waste disposal, thus, report by Andersen (2020), shows this disposal method releases toxin into the environment and encourages secondary transmission of diseases to human. Consequently, this practice does not conform to World Health Organization (WHO) guideline on treatment of waste from health care facilities.

Throughout history open dumps like throwing of waste in bushes have been used to solve solid waste problems (Jones 2013). Basically, the most important impacts of open dumping on the environment are public health and safety. Air quality has an impact on human and environmental health. Following open burning and low incineration practice. Open burning will have effect on humans as practice against incineration. Incineration of waste is least practiced in this study, implying insufficient release of pollutants into the air and reduced generation of ashes residue. Open burning of waste pollutes the atmosphere and with the high practice of open burning in this study, Moelling (2020) linked air pollution to more severe outcomes of corona virus infections.

Conclusion

The practice of respondents/households of Rumueme Community in Rivers State demonstrate that COVID-19 should be an early warning signal for prompt measure on waste management for a healthy environment.

Recommendation

In burning, households should ensure they follow emission requirements, so as to avoid secondary health impacts. Furthermore, uncontrolled dumping and open burning of waste should be discouraged or prohibited.

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SOCIAL AND BIOLOGICAL ADOLESCENT HEALTH PROBLEMS: THE WAY FORWARD

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Abstract

Adolescence is a unique phase of life and a significant period to lay the foundations of good health. The obvious being stated here is that most health challenges which individuals suffer in their adulthood are traceable to the lifestyles led during adolescence. This is because, during this stage of life, adolescents initiate patterns of behaviour which constitute health risks such as indulgence in smoking, alcohol and substance consumption, unprotected sex, unhealthy dieting, abortion, among others. This paper therefore sought to expose the imperatives of adolescent health, considering its social and biological effects on the individual and the population. The paper adopted qualitative analysis approach; relevant literatures were sourced from journals and textbooks in the internet for data. The paper concluded that healthy and well groomed adolescents will transit into healthy and responsible adults for the overall well-being of society, suggesting that appropriate legislations and enforcement should be put in place to guard against risk-taking behaviours among adolescents such as alcohol and tobacco consumption, drug abuse and violence.

Keywords: social, biological effect, adolescent health, problem

1.0 INTRODUCTION

Adolescence is one of the stages of human development; it comes after childhood stage, that is, it begins at the onset of puberty (when a girl and a boy, for the first time, begin to menstruate and produce live sperm respectively). There are eight stages of human development, namely pre-natal, infancy, early childhood, late childhood, adolescent, early adulthood, middle adulthood and old age. Adolescence is the period when one begins to develop personal and social identity; becomes aware of one's moral responsibility. The egocentric thought, which diminishes sometimes in childhood, shows up again at this stage. It is normal for every adolescent to explore, expand their boundaries, and become independent. According to Obisike (2017), this normally takes the form of arguments and unwillingness to adhere to family and societal norms.

According to World Health Organisation (WHO, 2021), adolescence is the stage of an individual's life between childhood and adulthood, which falls between ages 10 and 19. It is important to state here that the age bracket of 10 – 19 given by WHO has been the parameter for defining an adolescent for many decades. Many critics have continued to argue that this age-long categorization is no longer in agreement with present realities considering the impacts of social, economic, environmental and biological factors on human development. In particular, Sawyer et al. (2018) wrote:

Adolescence is the phase of life stretching between childhood and adulthood, and its definition has long posed a conundrum. Adolescence encompasses elements of biological growth and major social role transitions, both of which have changed in the past century. Earlier puberty has accelerated the onset of adolescence in nearly all populations, while understanding of continued growth has lifted its

endpoint age well into the 20s. In parallel, delayed timing of role transitions, including completion of education, marriage, and parenthood, continue to shift popular perceptions of when adulthood begins. Arguably, the transition period from childhood to adulthood now occupies a greater portion of the life course than ever before at a time when unprecedented social forces, including marketing and digital media, are affecting health and wellbeing across these years. An expanded and more inclusive definition of adolescence is essential for developmentally appropriate framing of laws, social policies, and service systems. Rather than age 10–19 years, a definition of 10–24 years corresponds more closely to adolescent growth and popular understandings of this life phase and would facilitate extended investments across a broader range of settings (p.223).

Yet, there are scholars who, though have acknowledged evidence of recent changes in the body development of adolescents, have disagreed with Sawyer et al. For example, McDonagh (2018), writing on behalf of the European Training Effective Care and Health Faculty, states that defining the developmental period from 10 to 24 years as adolescent adds no value but rather perpetuates the confusion in terminology that exists already. Basically, the intention here is not to denigrate any author's definition of adolescence, but to state that the age bracket of adolescence is now a subject of debate. The intensity of the arguments notwithstanding, the WHO's definition has willy-nilly been adopted by many authors, including this paper.

WHO states that adolescence is a unique phase of life and a significant period to lay the foundations of good health. The obvious being stated here is that most health challenges which individuals suffer in their adulthood are traceable to the lifestyles led during adolescence. This is because, during this stage of life, adolescents initiate patterns of behaviour which constitute health risks such as indulgence in smoking, alcohol and substance consumption, unprotected sex, unhealthy dieting, abortion, among others (WHO, 2021). Consequently, Bustreo and Chestnov (2013) advocated a life course approach that presents the understanding that tackling problems which occur in adulthood requires interventions in earlier stages of life. The interventions should not only be targeted at the adolescent or the population but also at the environments in which they live and learn. According to Bustreo and Chestnov, monitoring what happens to adolescents is necessary for achievement of Millennium Development Goals (MDGs) in the area of health. This means that adolescent health is a key area that should not be ignored by individuals, governments and organizations.

The health challenges of adolescence appear minimal when compared to other stages of life; hence adolescent age was seen as a relatively healthy phase of life generally and consequently health programmes did not focus much on adolescents (Satia, 2018). With turn of events in the area of HIV/AIDS, the narrative on adolescent health changed because it was noted in 2016 that 55,000 adolescents had died as a result of AIDS-related causes, making AIDS the leading cause of death among adolescents in Africa and the second worldwide (Avert, 2018). Other adolescent health issues that have been brought to the fore include teenage pregnancy and mental health.

Therefore, it has become implicit that adolescent health has social and biological effects on the individual and the population. These imperatives have made adolescent health a focal issue in the achievement and overall success of 2030 Agenda. This new focus has given impetus to this paper.

1.1 OBJECTIVES

This paper endeavoured to:

1. provide the concept of adolescent health problem.
2. discuss types of adolescent health problems.
3. explain social effect of adolescent health problems.
4. explain biological effect of adolescent health problems.

2.0 METHODOLOGY

This paper adopted qualitative analysis approach. Opinions and ideas on adolescent health problems and their social/biological effects were obtained from secondary sources and analysed qualitatively.

3.0 REVIEW OF LITERATURES

3.1 Concept of Adolescent Health

The term adolescent is used to describe young people or youth. Allen & Waterman (2019) designate the three stages of adolescence in this order: early adolescence (ages 10 – 13), middle adolescence (ages 14 – 17) and late adolescence (ages 18 – 21). Each of these stages is replete of certain health problems. The concept of adolescent health expresses strategies aimed at preventing, promoting and protecting the health of adolescents (WHO, 2017). According to WHO, the idea of adolescent health addresses:

- what health interventions should young people receive and when they should receive them?
- what health behaviours should they practice (or not practice)?

3.2 Types of Adolescent Health Problems

3.2.1 Early Pregnancy

Adolescence comes with sexuality issues such as awareness or consciousness of physical appearance, admiration for opposite sex. Girls, particularly, are more vulnerable to early sex which can lead to early pregnancy. Bernstein et al. (2006) noted that girls aged 11 – 14 are replete of this challenge. This is because their body appearance begins to be sexually attractive. Unsafe abortions and early pregnancy tend to occur in developing countries. Statistics show that approximately 12 million girls within the age range of 15 – 19 years and at least 777,000 girls under 15 years give birth each year in developing countries (Darroch et al; United Nations Population Fund in WHO, 2020).

The consequences of early pregnancy are obvious; the girls face higher risk of pregnancy related health challenges such as eclampsia, puerperal endometritis, systematic infections, low birth weight, preterm delivery and severe neonatal conditions than the girls who are above 20 years (WHO, 2016). The menace of early pregnancy has continued to permeate the regions of Africa despite its health and economic consequences. The reason for its persistence is the fact that factors responsible for it have not been surmounted. The factors include poverty, peer group pressure and media influence (Alabi & Oni, 2017). Other factors responsible for teenage pregnancy are inadequate formal education and unemployment (Ayuba & Gani, 2012). In many cases of early pregnancy in developing countries, lack of affordable reproductive health services and disapproval of birth control measures due to religious beliefs have worsened the prevalent rate of early pregnancy. The situation is further exacerbated if caesarian section is needed for delivery which most victim families cannot afford.

Early pregnancy generally ruins the girl-child life; she is made to drop out of school and in extreme cases, may not have the opportunity to learn any skill. She is sometimes stigmatized by her family and relations if she was impregnated by an unknown person. This means that one of the ways of empowering women is to discourage early pregnancy.

3.2.2 AIDS/HIV and Sexually Transmitted Infections (STIs)

Adolescents, both boys and girls, suffer AIDS/HIV and STIs because they are in the period of sexual activeness and attraction. Many of them contract these health problems as a result of forced sex. Many of the adolescents are victims of rape; some are forced into prostitution as a result of poverty. Yet many of them contract HIV and STIs through gay relationships. United Nations (2020) noted that adolescent girls and young women are at increased risk of acquiring HIV globally because they face gender-based violence. UN also reported that AIDS has become the major cause of death among adolescents in Africa and the second most common cause of death among adolescents in the world. What these facts portend is that the realization of the target of Goal 3 of the Sustainable Development Goals (SDGs) may be truncated. The goal seeks to promote well-being and ensure that peoples of all ages live healthy. By extension, the spread of AIDS/HIV and STIs results in diverse social issues such as loss of job, divorce, suicide, financial burden, among others.

3.2.3 Mental Health

Many of the problems of young people are associated with depressions and other psychological challenges which may be hidden from parents. In their bid to overcome the challenges, they may slip into metal problem and they are vulnerable when many stressors occur at the same time (DuBois et al.; Kling et al. in Bernstein et al., 2006). According to WHO (2020), exposure to harsh conditions of life, challenging life situations and early signs or symptoms of emotional or behavioural problems are vulnerable to mental disorders or self-harm. Here, harsh conditions experienced sometimes in schools when students face unpleasant punishments from teachers and their seniors. It can also occur as a result of academic pressure arising from unbalanced relation between chronological age and mental age. An adolescent, whose parents forced into a level of education or course of learning which is not in tandem with his age and maturation, is likely to face a mental challenge.

The issue of mental health is gradually becoming a silent killer globally because of lack of awareness of its risk factors. WHO (2020) avers that mental health is a key concern in adolescent health because poor mental health is the leading cause of disability among adolescents which occurs before the age of 14, and accounts for a large proportion of the global disease burden. It also leads to suicide which is the third leading cause of death in ages 15 – 19. WHO further states that poor mental health exposes adolescents to disability, and particularly, risk-taking behaviours such as alcohol and tobacco consumption, drug abuse, risky sex and violence. These behaviours are risk factors for non-communicable diseases. It is therefore, pertinent to sensitize teachers and parents in this direction.

3.2.4 Obesity

Obesity is one of the health problems which adolescents face; it is caused by unhealthy diet habit, a risky behaviour common during this critical age. Karacabey (2009) noted that regular exercise can be applied to help obese young people, stating that cases of obesity had increased globally. “Unhealthy diet” has two sides: underfeeding and overfeeding. While overfeeding results in obesity, underfeeding causes growth failure, delayed puberty, iron deficiency and slimness (Vadiveloo et al. 2009; Trowbridge et al., 2002). Obesity is more prevalent among female adolescents and its prevention should be encouraged (Adedayo & Ojofeitimi, 2013).

3.2.5 Injuries from Accidents

The age of adolescence is a period of active mobility, sports and other forms of physical exercises. Many adolescents globally have become physically incapacitated as a result of accidents at home, work, school or road. Some of the injuries are consequences of violence and street fight. Much of the

disease burden of adolescent injury emanate from road accidents. WHO (2021) reported that unintentional injuries are the leading cause of death and disability among adolescents in 2019 and that over 115,000 young people died as a result of road traffic accidents.

It has become necessary for government and relevant agencies to enforce traffic laws in order to reduce road traffic accidents.

3.2.6 Social Effect of Adolescent Health Problems

During the period of adolescence, social interaction among peer groups is at its peak; every adolescent will like to socialize. This explains why adolescence is a critical period of emotional development and socialization. Isolation and stigmatization during adolescence has social effects. The isolation or stigmatization ensues from the foregoing adolescent health problems. Their social effects include increased anxiety-like behaviours, depression-like behaviours and increased aggression (Orben et al. 2020).

As already stated, illnesses such as mental disorder and AIDs/HIV, even early pregnancy can cause loss of job, skills and opportunity to advance in education. To state the obvious, adolescent health problems lead to frustration and aggressiveness. It is possible that youth restrictiveness and violence may be traced to illness-induced frustration.

3.2.7 Biological Effect of Adolescent Health Problems

Naturally, adolescence is characterized by a number of physical changes which include mainly growth spurt and sexual maturation. These signs of puberty may develop at right time or early or late depending on individuals. Health problems of adolescents can impede the development of these physical changes. This is where the biological effects of adolescent health problems manifest. Obesity, for example, manifests biological effect on an adolescent in the form of heart-related challenges. Conversely, the adolescent may develop ulcer while watching weight (refusal to eat at the appropriate time). Mental health, an adolescent health problem, may affect adolescents biologically in the form of skin infections. This effect occurs when an adolescent is stressed up or depressed and may lack interest in personal hygiene. Another biological effect of adolescent health problem can be located in early pregnancy which often results in infections, obstructed labour which may lead to death.

3.3 THE WAY FORWARD

In order to reduce health problems among adolescents and ensure the emergence of viable adults in society, the actions below are suggested.

1. Rape cases should be reported immediately to health facilities by parents/guardians and victims (where possible) for immediate health care to avoid pregnancy and infections. To achieve this target, sensitization and advocacy campaigns should be carried out by health personnel in every locality.
2. Parents should make effort to control their children's access to social media platforms.
3. Family planning should be encouraged by schools, civil societies and faith-based organizations.
4. Appropriate legislation and enforcement should be put in place to guard against risk-taking behaviours among adolescents such as alcohol and tobacco consumption, drug abuse and violence.
5. Nutritionists should be employed in schools to educate students and parents on appropriate dieting.
6. Psychosocial support should be given to students by teachers and parents when they begin to manifest signs of depression and anger.

7. Professionals such as health personnel, teachers, and psychologists can offer helpful advice to parents and other members of the society about how to engage adolescents in discussing puberty issues so that they will not be caught unawares when the changes manifest.
8. Government and relevant agencies should enforce traffic laws in order to reduce road traffic accidents which may cause permanent disability or even death among adolescents and other road users.
9. Government and parents should provide adolescents with unhindered access to quality education, at least, to senior secondary level in order to avert the risks associated with secondary school dropouts. Completion of secondary education should be made compulsory in Nigeria through legislation.

3.4 CONCLUSION

Adolescence is a time of critical phase of development between childhood and adulthood. It is a period when significant physical, psychological, and behavioral changes occur and when young people develop many of the habits, behaviours, and relationships they will carry into their adult lives. The health system has a crucial role to play in promoting healthful behaviour and preventing diseases during adolescence. This stage of development is significant in the life of individuals and society because their perception of life and disposition towards general well-being will determine the type of adults that will emerge to be in charge of social institutions. Simply put, healthy and well groomed adolescents will transit into healthy and responsible adults for the overall well-being of society.

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IMPACT OF WASTE MANAGEMENT DEFICIENCIES ON SOIL AND GROUNDWATER: ITS KNOWLEDGE, ATTITUDE, PERCEPTION AND PUBLIC HEALTH IMPLICATIONS

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Abstract

This study undertook both experimental and non-experimental research approach to investigate the impact of waste management deficiencies on soil and groundwater; its knowledge, attitude, perception and public health implications in Port Harcourt and its environs during the dry and wet seasons of 2020. Five (5) sampling stations were established and designated as SS1 GW1, SS2 GW2, SS3 GW3, SS4 GW4 and SS5 GW5. SS (1-5) represent soil sample while GW (1-5) represent groundwater samples. SS5 GW5 was used as the control station. Soil and groundwater samples were collected within and around waste dumpsites for physicochemical (pH, electrical conductivity, temperature, dissolved oxygen, alkalinity, total hardness, acidity, salinity, turbidity, biological oxygen demand, total dissolved solid, total suspended solid, phosphate, nitrate and sulphate) and heavy metal (lead, cadmium, magnesium, manganese, copper, nickel, iron, zinc, arsenic, mercury) including total organic compound, total hydrocarbon, total coliform and faecal coliform analyses. BOD, Salinity, TDS, EC, pH, DO and Temperature were analyzed *in situ*. Water samples were collected in 10ml sterile plastic containers for the determination of other physicochemical variables and transferred in an ice packed cooler to preserve their integrity while the heavy metal for the soil samples were collected with a hand auger and placed in a foil paper; and sample for total hydrocarbons were placed in a zip-log bag onward to the laboratory for further investigation. Some physicochemical properties of soil such as Electrical Conductivity, Sulphate ion, Phosphate ion, Nitrate ion and Total Hydrocarbon had wide variation while groundwater showed narrow variations in levels of pH, Temperature, Dissolved Oxygen and BOD during the study period. The pair wise comparison of the edaphic parameter using the student t-test revealed that pH, Temperature, Salinity, and Mn were significant at $P < 0.05$ between the dry and wet season. PO_4^{3-} in soil correlates positively with PO_4^{3-} ions in water ($r = 0.645$) at $P < 0.05$. However, the pollution index of Fe in GW1 and GW3 were higher than the regulatory standard during the wet season while Cu in GW4, Fe GW1 and GW2 including Mn in GW2 were higher than the regulatory standard ($\text{PI} > 1$) during the dry season. The overall pollution index of the heavy metal appeared as $\text{Zn} > \text{Fe} > \text{Cu} > \text{Pb} > \text{Mn}$ which is a great concern to public because excess ingestion of these metals mostly Pb have been implicated with organ related health issues. Households are responsible for the management of their waste and most of the streets in Port Harcourt do not have designated waste collection centres. Most the residents dispose their waste into sanitary drains and at median of major roads. Thus, there is need for all water vendors to monitor and treat their water sources to guarantee healthy consumption by the public and there should be provision of waste management infrastructure at all levels of the process.

Keywords: soil, groundwater, heavy metal, pollution index, waste management

Introduction

Different schools of thought have different meanings about the word, waste. In waste management, Ogbonna et al. (2002) defined waste as “something” which the owner no longer wants at a given time and space and which has no current or perceived market value. According to Kafando et al. (2013), waste is any residue of a production, processing or use of any substance, material product or more generally, any personal property abandoned, or which the owner intends to abandon. Waste could be domestic, industrial, agricultural, commercial, municipal, constructional, hospital or medical, institutional etc. depending on the source(s). It could be hazardous or non-hazardous. More so, it may be in the form of solid, liquid (sewage and sullage) or gaseous (Naranyanan, 2011; Bhatia, 2007; Kiely, 1998).

In most cities of the developing countries, the issue of sound waste management has been a major problem. However, waste management simply means the application of those procedures that will ensure and promote the logical arrangement and implementation of the functions of sorting, or segregation, collection, transportation, processing, treatment and disposal. According to Kofoworola (2007), it is an organized and systematic channeling of waste through pathway to ensure that they are disposed of with attention to acceptable public health and environmental safeguards. The nexus for sound waste management is to ensure health and safety of man and his environment. As human population increases, the waste generation capacity also increases. Coupled with modern transportation, urbanization, agriculture, technology, industrialization etc., waste has become more sophisticated and demand special attention. Brunner et al. (2014) and Robinson (1986) noted that the environmental concern globally is that waste should be properly collected and disposed of in the most friendly and acceptable manner.

The ongoing waste management operation in Port Harcourt and its environs is not in compliance with sound waste management system as there is no procedure in place to ensure and promote the logical implementation of the basic principle of waste management as observed. Thus, the indiscriminate and unregulated disposal of waste in Port Harcourt and its environs may have been an upshoot of the waste management deficiencies. Waste is disposed at every blind alley because there are no waste management infrastructures such as dumpsters, effective and efficient waste transportation vehicles for waste collection and disposal, lack of storage and treatment facilities among others. Such deficiencies may have exerted negative impact on the environmental media.

Nonetheless, several studies have averred that the impact of waste on soil, groundwater and air are many and varied and constitute health challenges. For example, Syeda and Azsra, (2013); Neera and Priyanka (2011) and Shaloy et al., (2009) maintained that in the soil, heavy metals can be taken up by plants mostly at municipal waste dumpsites and this can interfere with the food chain. More so, open burning of waste can constitute smoke nuisance (atmospheric pollution), fire risk, produce CO₂ which encourages climate change etc. The by-product of combustion i.e. the ash could contain some quantum of heavy metals which can seep into the soil causing soil and groundwater contamination (Khummallo, 2016; Esimai & Irinoye, 2016). According Santra (2012) and Kiely (1998), Lead (Pb), Arsenic (As) and Cadmium (Cd), Zinc (Zn), Copper (Cu) and Mercury (Hg) could easily be detected in municipal waste dumpsites due to waste materials like battery, leather, plastics, paints containers, and other solvents. In Port Harcourt, some inhabitants are carrying out subsistence farming on derelict waste dumpsites. The continuous consumption of agricultural products from such area could influence the health status of people. Also, groundwater quality could be impaired and consumers of such groundwater may have health challenges (Hossain et al., 2014; Oyelami, et al., 2013; Marconvecchio et al., 2007).

The public perception of waste management in Port Harcourt and its environs is that it is the sole responsibility of government to manage waste (Bibiye, 2021). Even though the constitution of

the Federal Republic of Nigeria in the Forth Schedule assigned such responsibility to the Local Government, the public are also major stakeholders and therefore are expected to partake in the daily management of these wastes. Thus, widespread of public education programme is needed to cushion these effects and to ensure international best practices of waste management (Jonathan, 2019; Tarti et al., 2018; UNCH/HABITAT, 1989).

However, this study is geared towards determining some selected heavy metals in soil and groundwater including the associated public health risk, evaluation of the Knowledge, Attitude and Perception (KAP) on current waste management practices and waste disposal systems in Port Harcourt and its environs and to proffer mitigation for improvement of waste management systems in Port Harcourt and its environs.

Methodology

Non-Experimental process: The study considered both experimental and non-experimental research approach. Descriptive study design is employed for the study. A sample size of 800 was computed for Port Harcourt city and Obio/Akpor Local Government Area respectively, using the Taro Yamene formula: $S = N / 1 + N(e)$, where S = Sample size, N = Population size of the study, e = Tolerable error, 1 = Theoretical constant. Well-structured questionnaires were utilized as instrument for data collection.

Table 1: An Excerpt of National Population Commission

Rivers LGAs	Population Census 1991-11-26	Population Census 2006-03-21	Population Projection 2016-03-21
PHALGA	440,399	538,558	756,600
OBALGA	263,017	462,350	649,600
IKWERRE	125,386	188,930	265,400
TOTAL	3,187,844	5,198, 716	7.303,900

Source: webmaster@riversstatenigeria.net

Experimental process: Five samples stations were identified and designated as GW1 SS, GW2 SS2, GW3 SS3, GW4 SS4 and GW5 SS5. GW represents groundwater while SS represents soil sample and GW5 and SS5 defined the control stations respectively. Groundwater samples in proximal relation to waste dump sites were collected for various analyses in clean containers after rinsing the containers with the sample to be collected. The sampling containers were filled to the brim to expel oxygen which could trigger reactions and falsify results. Groundwater samples for heavy metals were preserved with concentrated Nitric acid to pH 2 to prevent the metal ions from forming a precipitate that could adhere to the walls of the sampling containers. Water samples for physicochemical and microbiology analyses were preserved in ice chests to inhibit the activity of microbes. Soil samples were collected with the aid of a hand Auger. The soil samples were collected between (0-15) cm, (15-30) cm and (30-45) cm respectively. Soil samples were fixed with 2 drops Hydrochloric acid (HCl), and all was transferred in an ice-packed cooler to the laboratory for the analysis of some heavy metal and physicochemical parameters. *In-Situ* Measurements of pH, EC, DO, Temperature, BOD, TDS, and Salinity were measured in triplicates and the average was taken and recorded using a Portable Digital Multi-Parameters Meter (PDMPPM). The result was analysed using the single factor ANOVA, and the Turkey Pair-Wise Test in determining the location of the significant

difference.

Table 2: Zonation and Distribution of Questionnaire in Some Selected Areas in in Port Harcourt Local Government Area (Phalga) (Non-Experimental)

ZONES	PHALGA	GPS (UTM)	STATION
CODE	FDIQ (%)	FREQ (%)	NAME
1	TN	57(14.25%). 57(14.69%).	02801N 05270E Township/Borokiri
2	TA	57 (14.25%). 54(13.92%)	02829N 05326E Trans Amadi
3	DL	57(14.25%) 55(14.18%)	02787N 05314E D-Line/Old GRA
4	DM (1-3)	58(14.50%) 54(13.92%)	02785N 05314E Diobu (Mile 1-3)
5	AB	57(14.25%). 57(14.69%).	02824N 05295E Abuloma
6	OG	57(14.25%). 55(14.18%)	02838N 05310E Ogujaju Ama
7	AA	57(14.25%). 56(14.42%)	02816N 05302E Amadi Ama
TOTAL	400 (100%)	388 (100%)	

FDIQ=Frequency of distributed questionnaires within zone, FREQ=Frequency of retrieved questionnaire within zone, GPS=Geographical Position System, UTM=Universal transverse meter.

Table 3: Zonation and Distribution of Questionnaire in Some Selected Areas in Obio/Akpor Local Government Area (Obalga) (Non-Experimental)

ZONES	OBALGA	GPS (UTM)	STATION
CODE	FDIQ (%)	FREQS (%)	NAME
8	RME	57(14.25%). 57(14.54%).	02763N 05324E Rumueme
9	RML	57 (14.25%). 57(14.54%)	02717N 05325E Rumuolumini
10	CHA	57(14.25%) 56(14.29%)	02684N 05415E Choba
11	RDA	57(14.25%). 56(14.29%)	02780N 05384E Rumuodomanya
12	RKI	58(14.50%) 56(14.29%).	02845N 05376E Rumuokurishi
13	RMA	57(14.25%). 56(14.29%)	04500N 06594E Rumuola
14	WJI	57(14.25%). 54(13.76%)	02838N 05328E Woji
TOTAL	400 (100%)	392 (100%)	

FDIQ=Frequency of distributed questionnaires within zone, FREQ=Frequency of retrieved questionnaire within zone, GPS=Geographical Position System, UTM=Universal transverse meter.

Result

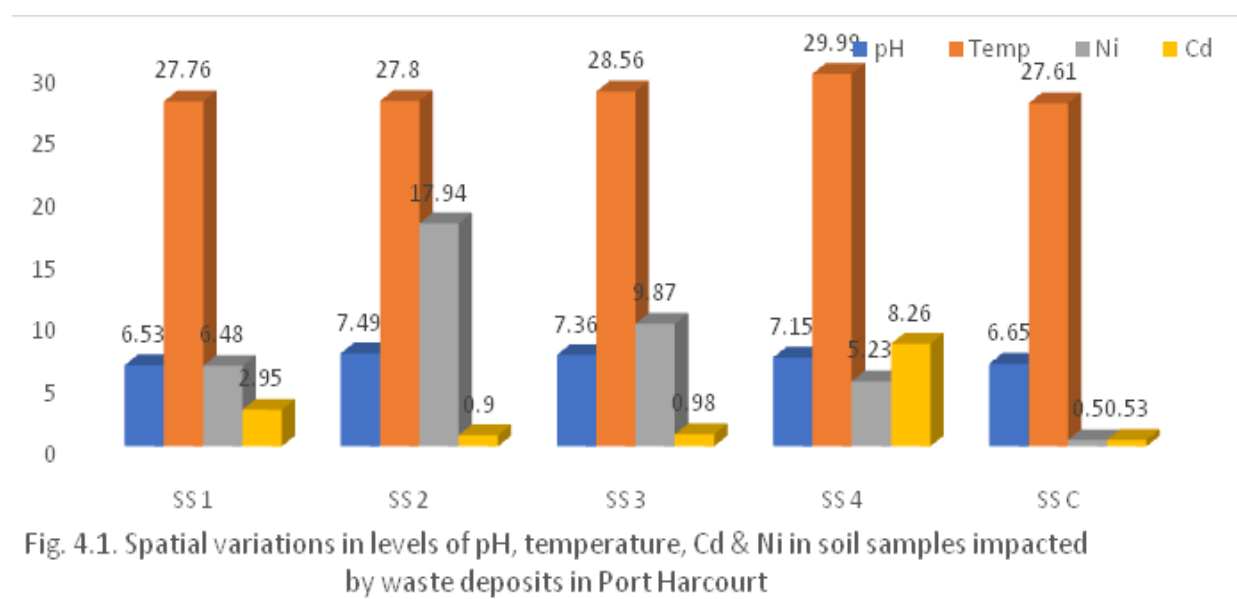
There were variations in levels of the edaphic parameters measured across the sampling locations. At sampling location 1 (SS1), minimum mean value of pH was 6.53 (± 0.19) while its maximum mean value of 7.49 (± 0.23) was recorded in SS2. Temperature had a minimum mean value of 27.61 (± 0.34) °C in SSC while its maximum mean value of 28.99 (± 0.70)°C was recorded in Ss4. The minimum mean value of Ni 0.50(± 0.32) mg/kg was recorded in SSC whereas its maximum mean

value of $17.94(\pm 4.85)$ mg/kg was recorded in SS 2 and the minimum mean value of Cd

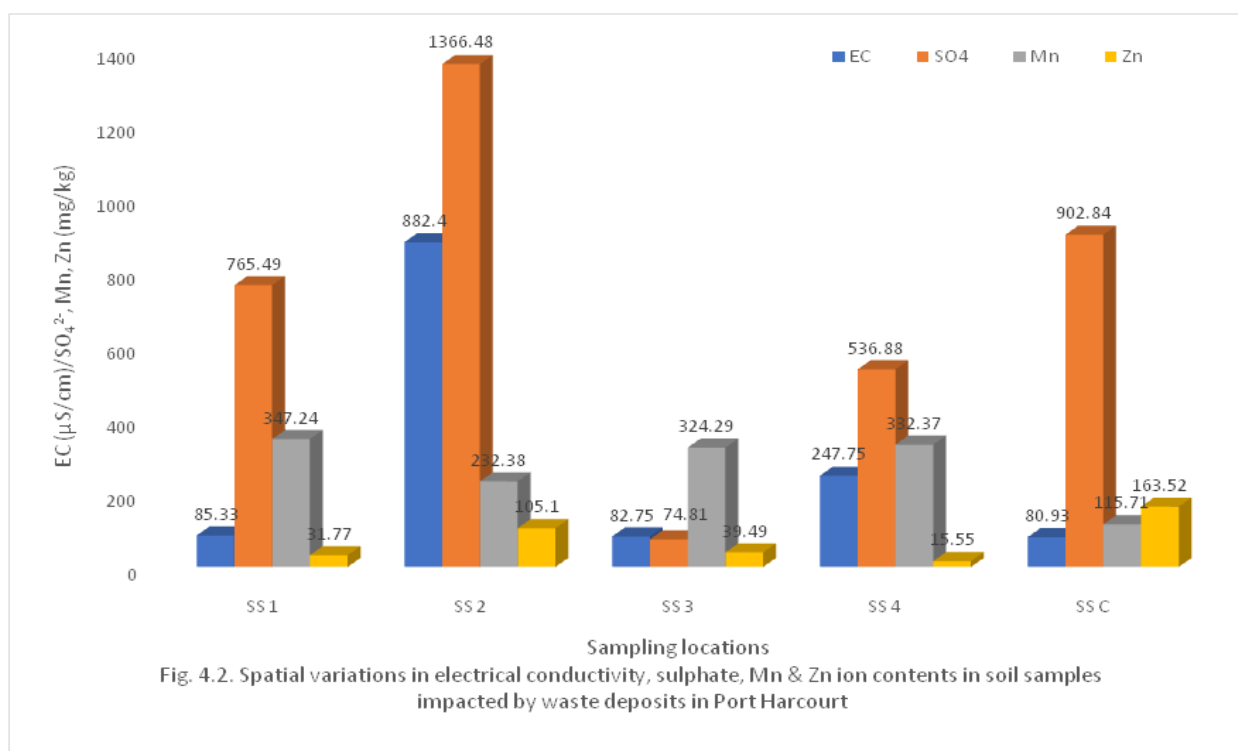
Table 4: Sample Collection Sites and Status (Experimental)

S/No.	Sample Location	Sample Code	Status
1.	Mile 4 Dumpsite (Apara well 10 Elijiji, Opposite C. Bennett Specialist Hospital Rumueme).	GW 1 SS 1	Active
2.	MbodoAluu Dumpsites (Tam David West Airport Road, Opposite OPM).	GW 2 SS 2	Derelict
3.	Eneka Dumpsite (Rukporkwu/Eneka line Road, Rumuaopu).	GW 3 SS 3	Derelict
4.	RIWAMA Dumpsite (MbodoAluu B/4 Checkpoint along Tam David West Airport Road).	GW 4 SS 4	Active
5.	Control Sampling Point (Close to Jephthah Comprehensive School along East-West Road).	GWC 5 SS C	Control

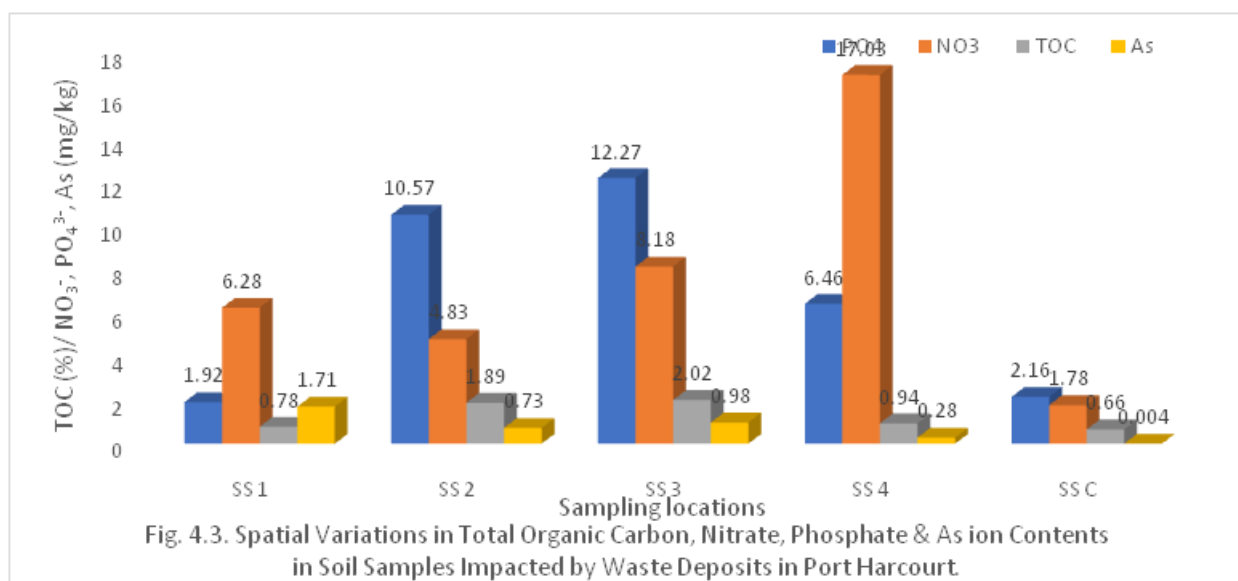
$0.53(\pm 0.15)$ mg/kg was recorded in SSC while its maximum mean value of $8.26(\pm 0.93)$ mg/kg was recorded in SS 4 respectively (Fig. 4.1). At SS 2, the minimum mean values EC, SO_4^{2-} , Mn and Zn were $80.93 (\pm 18.30) \mu\text{S/cm}$, $74.81 (\pm 7.881) \text{ mg/kg}$, $115.71 (\pm 2.70)$ and $15.55 (\pm 1.54) \text{ mg/kg}$ while their maximum mean values $882.40 (\pm 200.52) \mu\text{S/cm}$, $1366.48 (\pm 416.65) \text{ mg/kg}$ and $163.52 (\pm 150.02) \text{ mg/kg}$ were in SS2, SS 2, SS1 and SS 5, respectively (Fig. 4. 2). The minimum mean values of PO_4^{3-} $1.92 (\pm 0.50) \text{ mg/kg}$, NO_3^- $1.78 (\pm 0.43)$, TOC $0.66 (\pm 0.08) \text{ mg/kg}$ and As $0.004 (\pm 0.00) \text{ mg/kg}$ were recorded in SS 1, SS 5, SS 5 and SS 5 while their maximum mean values of $12.27 (\pm 1.03) \text{ mg/kg}$, $17.024 (\pm 5.73) \text{ mg/kg}$, $2.02 (\pm 0.10) \text{ mg/kg}$ and $1.71(1.71) \text{ mg/kg}$ were recorded in SS 3, SS 4, SS 3 and SS 2, respectively (Fig. 4.3).



Minimum mean concentration values for THC 1.72 (± 0.50) mg/kg, Cu 3.43 (± 0.63) mg/kg, Pb 5.05 (± 4.32) mg/kg and Mg 43.08 (± 3.05) mg/kg were recorded in SS 5, SS 5, SS 4, and SS 1 though, their maximum mean concentration values of 100.19 (± 12.10) mg/kg, 58.97 (± 29.12) mg/kg, 271.73 (± 270.46) mg/kg and 96.90 (± 3.75) mg/kg were recorded in SS 3, SS 1, SS 5 and SS 2, correspondingly (Fig. 4.4).



A pairwise comparison in levels of the physicochemical (groundwater) parameters using the student t-Test (Table 5) revealed that pH (Sig. = 0.00); Temperature and Total Coliform count (Sig. = 0.00), Mn and Salinity (Sig. = 0.01), Total Hardness (Sig. = 0.03) and NO₃⁻ (Sig. = 0.05) were significantly different between the dry and wet season at the 95% confidence interval of the difference. The result from the Principal Component Analysis (PCA) revealed communalities that were all high, indicating that the extracted components represented the variables well. The first nine (9).



Principal Components (PCs) formed the extraction solution, with a cumulative percentage variability of 100% in the original 47 variables (Table 6). This reduces the complexity of the data set by using these components, with 0% loss of information. The rotation maintained the cumulative percentage of the variance explained by the extracted components (Table 7).

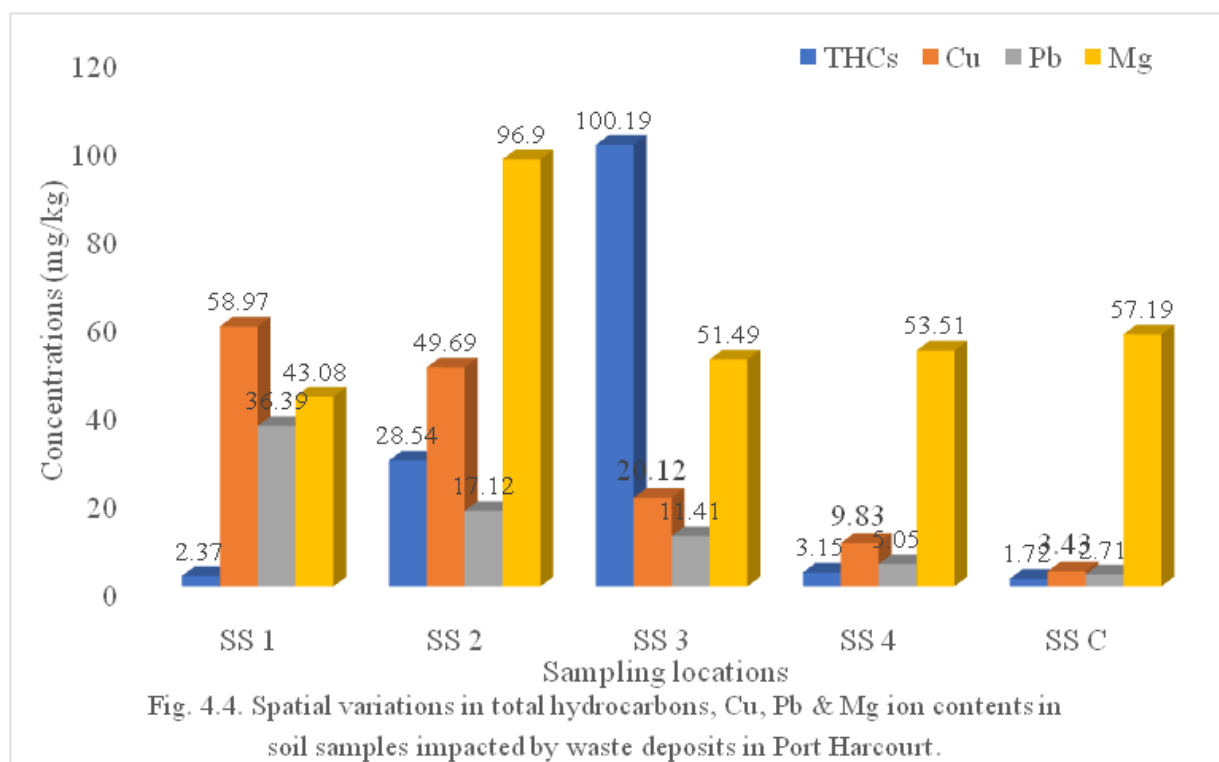


Table 5 Paired Difference in Levels of the Physicochemical Parameters of the Groundwater Sampled

Parameter/Seasons		Mean	SE	Sig. Value	Significant (P<0.05)
pH	Dry	6.46	0.20	0.00	Significant
	Wet	7.00	0.14		
Temp.	Dry	28.87	0.28	0.00	Significant
	Wet	27.63	0.14		
Salinity	Dry	21.36	9.85	0.01	Significant
	Wet	20.14	9.61		
Turbidity	Dry	3.80	2.85	0.03	Significant
	Wet	5.62	3.27		
Alkaline	Dry	3.27	0.70	0.02	Significant
	Wet	3.84	0.60		
T. Hardness	Dry	4.45	0.70	0.03	Significant
	Wet	5.55	0.58		
NO ₃ ⁻	Dry	6.62	1.82	0.05	Significant
	Wet	5.99	1.70		
Mn	Dry	206.81	33.81	0.01	Significant
	Wet	199.31	32.56		
T. Coliform	Dry	14.17	2.03	0.00	Significant
	Wet	16.38	2.14		

Temp.=Temperature, T. Hardness=Total Hardness.

The Scree plot (Fig. 4.5) represents the Eigenvalue of each component in the initial solution. The extracted components are on the steep slope (dissimilar) while the components on the shallow slope (similar) contributed nothing (0%) to the solution. The last big drop occurred between the 9th and the 10th components (Fig. 4.5).

Table 6: Extraction Sums of Squared Loadings in Total Variance Explained of the Physicochemical Properties of Soil

Component	Total	% of Variance	Communalities %
1	12.73	27.08	27.08
2	8.38	17.82	44.90
3	7.11	15.12	60.03
4	5.46	11.61	71.62
5	4.66	9.92	81.55
6	3.48	7.41	88.96
7	2.46	5.29	94.24
8	1.49	3.17	97.42
9	1.22	2.58	100.00

Table 7: Rotation Sums of Squared Loadings in Total Variance Explained of the Physicochemical Properties of the Soil

Component	Total	% of Variance	Communalities %
1	8.97	19.09	19.09
2	7.67	16.31	35.40
3	7.05	15.09	50.41
4	4.87	10.35	61.76
5	4.29	9.13	69.90
6	4.04	8.59	78.49
7	3.95	8.40	86.89
8	3.79	8.06	94.94
9	2.38	5.06	100.00

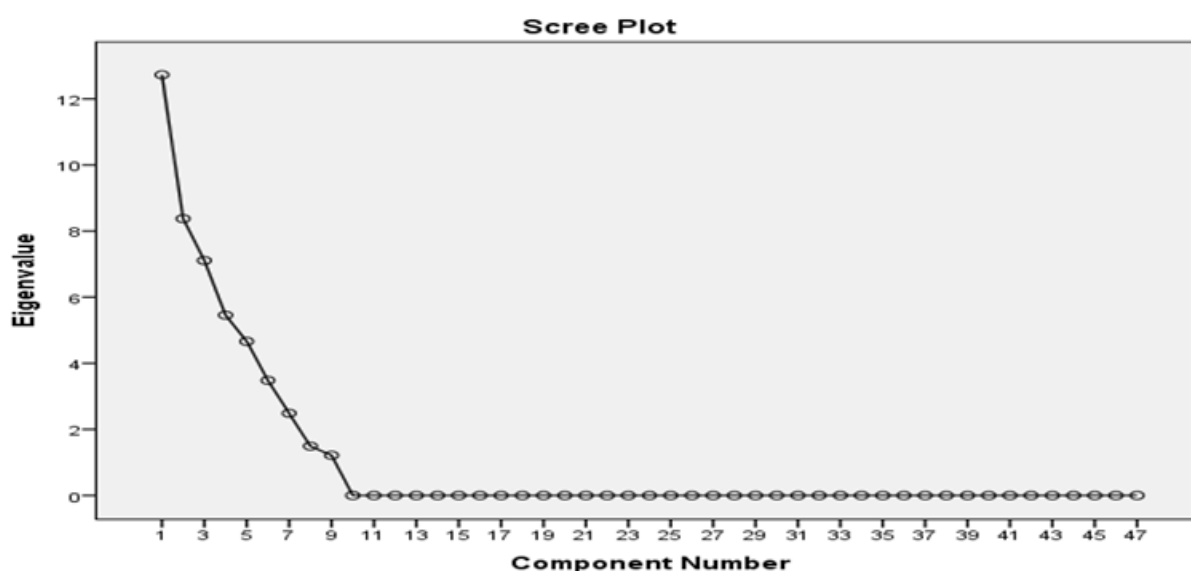


Fig. 4.5: The Scree Plot of Eigenvalue showing similar component (10-47) and dissimilar component (1-9).

To assessing the levels of health risk accompanying some selected heavy metals (Cd, Pb, Cu, As, Fe, Mn, Hg, Ni and Zinc) ingestion (oral) from groundwater in proximal relation to waste dump sites were computed for pollution index. The pollution index of each of the metal across the five-sampling stations during the dry season indicated that the value of Fe at GW1(3.21E+1) and GW3 (1.84E+1) is greater than unity (Table 8) while in the wet season, Cu at GW4(6.00E+1), Fe at GW1(3.30E+1) and GW2 (1.00E+1), and Mn at GW2(1.24E+1) (Table 9) had greater values that is above the permissible standard ($H > 1$).

The overall pollution index of the heavy metal under investigation indicated that Fe(2.44E+1) during the dry season is greater unity and Cu(4.33E+1), Fe(2.45E+1), Pb(2.25E+1) and Mn(1.07E+1) during the wet season (Table 10) were also greater than unity ($H > 1$). This contradict the public health water quality standard for human consumption as posited by the World Health Organization (WHO) and the National Standard for Drinking Water Quality (NSDWQ).

Table 8: Pollution Index (PI_{IM}) of each Metal across Groundwater sampling location during the Dry Season

Parameters	GW1	GW2	GW3	GW4	GW5	Average
Cd	6.00E-2	8.00E-2	4.00E-2	8.00E-2	6.00E-1	1.72E-1
Cu	3.10E-1	2.70E-1	2.80E-1	2.90E-1	3.10E-1	2.92E-1
Ni	4.00E-5	3.50E-5	3.60E-5	3.70E-5	4.00E-5	3.76E-5
Fe	3.21E+1	8.40E-1	1.84E+1	3.90E-1	1.67E-3	1.26E+1
Pb	1.30E-1	1.10E-1	1.20E-1	1.10E-1	1.20E-1	1.18E-1
Zn	1.40E-3	9.60E-3	1.00E-3	2.20E-3	2.00E-5	2.84E-3
Mn	2.40E-1	8.40E-1	3.80E-1	7.60E-1	6.20E-1	5.68E-1
As	3.50E-1	3.50E-1	3.50E-1	3.50E-1	4.10E-1	3.64E-1
Hg	5.000E-2	5.50E-2	8.50E-2	6.50E-2	2.00E-2	5.50E-2

Table 9: Pollution Index (PI) of each Metal across Groundwater sampling location during the Wet Season

Parameters	GW1	GW2	GW3	GW4	GW5	Average
Cd	2.00E-3	4.20E-1	4.60E-1	4.20E-1	4.80E-1	3.96E-1
Cu	9.20E-1	3.10E-1	1.39E-1	6.00E+1	4.60E-1	1.82E+1
Ni	1.30E-1	4.00E-2	4.00E-2	7.00E-2	6.00E-2	6.80E-2
Fe	3.31E+1	1.00E+1	2.00E-1	2.70E-1	2.80E-1	1.01E+1
Pb	4.00E-1	5.30E-1	6.00E-1	7.00E-2	3.20E-2	3.84E-1
Zn	3.40E-3	5.00E-3	3.60E-3	3.82E-3	3.40E-3	3.93E-3
Mn	8.20E-1	1.24E+1	4.20E-1	9.40E-1	9.40E-1	8.72E-1
As	4.70E-1	4.70E-1	5.10E-1	4.20E-1	3.90E-1	4.52E-1
Hg	2.60E-1	2.90E-1	2.50E-1	1.80E-1	1.65E-1	2.29E-1

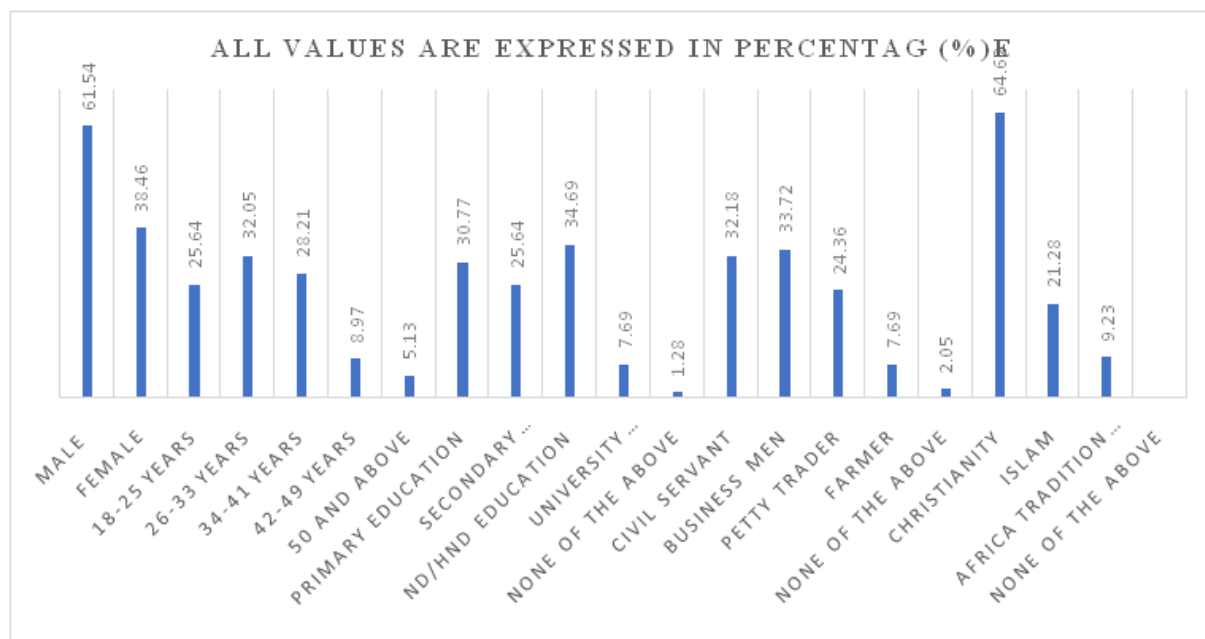
Table 10: Overall Pollution Index (PI) of Each Heavy Metal

Seasonal Variation	Cd	Cu	Ni	Fe	Pb	Zn	Mn	As	Hg
PI (DS)	4.41E-1	3.01E-1	3.88E-5	2.44E+1	1.245E-1	7.08E-3	7.17E-1	3.88E-1	6.02E-1
PI (WS)	4.40E-1	4.43E+1	1.04E-1	2.45E+1	4.25E+1	4.49E-3	1.07E+1	4.82E-1	2.61E-1
RfD	500E-4	3.00E-4	2.00E-2	7.00E-1	4.00E-3	3.00E-1	1.40E-1	3.00E-4	5.00E-4
US EPA	5.00E-3	1.30E-3	1.00E-1	3.00E-1	1.50E-2	5.00E-1	5.00E-2	1.00E-2	2.00E-3

Source: Author's Field Survey, 2020. DS=Dry Season, WS=Wet Season, PI=Pollution Index, RfD=Reference dose by ingestion (mg/kg/day) for non-carcinogenic from US EPA, 2000d, 2005; FAO/WHO PTWI, 2004; US EPA IRIS, 2006.

The demographic variables of the respondents revealed that in Fig. 4.6, the total percentage respondents of males were 61.54% while 38.46% represents the total number of female respondents. 25.64% represents age bracket between 18-25years, 32.05% represents age bracket between 26-

The demographic variables of the respondents revealed that in Fig. 4.6, the total percentage respondents of males were 61.54% while 38.46% represents the total number of female respondents. 25.64% represents age bracket between 18-25years, 32.05% represents age bracket between 26-33years while 28.21% represents age bracket between 34-41years and 8.97% represents age bracket between 42-49years and 5.13% represents age bracket 50years and above. More so, 30.77% respondents have primary level of education, 25.64% have secondary level of education whereas 34.62% have ND/HND level of education while 7.69% have university level of education and 1.28% of the respondents do not have any certificate.



Source: Author's Field Survey, 2020

Fig. 4.6 Demographic Variable of Respondents in Percentage

Again, 32.185% respondents were civil servant, 33.72% respondents were businessmen while 24.36% of the respondents were Petty traders and 7.69% of the respondents were Farmer whereas 2.05% represent none of the above. Finally, 64.62% of the respondents were Christian, 21.28% of the respondents were Islam, 9.23% respondents were African Traditional Religion while 4.87% of the respondents do not belong to any of the above religion.

In Table 11, 16.86% strongly agree (SA) that household are responsible for the management of their waste in Port Harcourt while 3.65% of the respondents strongly disagree (SD). 12.8% strongly agree that waste collection system (kerbside and communal) is poorly carried out Port Harcourt and its environs while 3.17% strongly disagree and 6.94% maintained that Most people dispose their waste directly at designated collection centers while 18.64% strongly disagree to the that assertion. 4.61% of the respondents strongly agree that waste vendors usually collect waste from yard to yard for disposal within Port Harcourt and its environs while 26.55% strongly disagree. Also, 5.17% of the respondents asserted that every street in Port Harcourt and its environs has waste collection Centre regulated by RIWAMA while 24.12% strongly disagree to it. 18.62% of the respondents averred that open dumping is the most common disposal method used in Port Harcourt and its environs whereas 3.65% strongly disagree. 7.07% of the respondents strongly agree that waste trucks move street by street to collect waste in Port Harcourt and its environs while 13.76% of the respondents strongly disagree. 14.9% maintained that some individuals move their own waste

and discard it at any blind alley whereas 1.58% of the respondents strongly disagree and finally, 13.97% of the respondents maintained that most individuals removed their waste from the polytene bags and place them at the median of major roads in Port Harcourt and its environs while 4.87% of the respondents strongly disagree.

Table 11: Current Waste Management Practices and Patterns in Port Harcourt and its Environs

S/N	Questionnaire Statement	SA	A	U	D	SD	TWS	NO R	\bar{X}	Remark
1.	Households are responsible for the management of their waste in Port Harcourt	1810 16.86%	1012 12.26%	45 11.03%	240 6.55%	30 3.65%	3137	780	4.05	Accept
2.	Waste collection system (kerbside and communal) is poor in Port Harcourt and its environs.	1375 12.80%	1372 16.62%	60 14.71%	332 9.06%	26 3.17%	3163	780	4.06	Accept
3.	Most people dispose their waste directly at designated collection centres.	745 6.94%	772 9.35%	198 48.04%	498 13.59%	153 18.64%	2276	780	2.92	Reject
4.	Waste vendors usually collect waste from yard to yard for disposal in Port Harcourt.	495 4.61%	40 0.49%	12 2.94%	710 19.38%	218 26.55%	1455	780	1.87	Reject
5.	Every street in Port Harcourt and its environs has waste collection Centre regulated by RIWAMA.	555 5.17%	676 8.19%	6 1.47%	600 16.38%	198 24.12%	2035	780	2.61	Reject
6.	Open dumping is the most common disposal method used in Port Harcourt and its environs.	2000 18.62%	1040 12.60%	6 1.47%	180 4.91%	30 3.65%	3256	780	4.17	Accept
7.	Waste trucks move street by street to collect waste in Port Harcourt and its environs.	759 7.07%	783 9.49%	3 0.74%	622 16.98%	113 13.76%	2280	780	2.92	Reject
8.	Some individuals move their own waste and discard it at any blind alley.	1500 14.90%	984 11.92%	60 14.71%	202 5.51%	13 1.58%	2759	780	3.54	Accept
9.	Most individuals move their waste and place them at the median of major road in Port Harcourt and its environs.	1500 13.97%	1576 19.09%	18 4.41%	280 7.64%	40 4.87%	3414	780	4.38	Accept

Source: Author's field survey, 2020. SA= Strongly agree, A= Agree; U=undivided, D= Disagree, SD = Strongly disagree, TWS= total weighted Scores; NOR=Number of responses; \bar{X} = mean

Discussion

In the soil, the mean physicochemical properties of soil recorded in this study was high and comparable to that obtained by Agbeshie *et al.*, (2020) in Sunyani, Ghana. However, values were lower than those recorded by Marcus *et al.*, (2017) and Ozoekwe *et al.*, (2020) all in Port Harcourt, Rivers State, South-South Nigeria. The pH factor defines the acid base composition (physical, chemical, and biological developments) within the soil (Praveena *et al.*, 2016). The observed slightly high pH values (7.49) in SS2 (a derelict waste dumpsite at MbodoAluu), (7.36) in SS3 (an active waste dumpsite at along Eneka/Rukpokwu road) and (7.15) in SS4 (an active dumpsite at Mbodo Aluu before Checking point along Tam David West), respectively define an alkaline medium super-imposed by weather (longer rainy season). The highest value of these alkaline media was recorded in Sample Station (SS 2). pH is also important in agriculture as some plant grow well in soils with pH of 7-8 (Odesina, 2003). This slightly high pH value of soil in this study may be due to liming materials and some activities of microorganisms on the solid waste. This is in line with Obianefo *et al.*, (2017) in Port Harcourt who maintained that microbial activities on solid waste cum liming materials could create an increase in the pH value. Soil temperature is a significant factor most especially in agriculture and land treatment of organic wastes. This hinges on the fact that growth of biological systems is closely regulated by soil temperature. The mean soil temperature ranged from 26.12-31.63(28.14±0.22)°C. The highest concentration of Temperature (29.99)°C was recorded in SS2 - an active dumpsite in MbodoAluu before Checking-point along Tam David-West Airport Road while the minimum concentration (27.61)°C was recorded in SS Control (close to

Jephthah Comprehensive School along East-West Road).

Heavy metals are often found on soil within and around waste dumpsites (e.g., Lead, Mercury, and Cadmium). Waste dumpsite with its high level of heavy metal significantly impact on soil chemical properties and therefore could alter the nutrient balance which can ultimately affect crop productivity and diversity (SWSR, 2015; Montanerella *et al.*, 2015; Cortez *et al.*, 2014). Mercury (Hg), cadmium (Cd), copper (Cu), and Zinc (Zn) are mostly found within municipal solid (MSW) waste dumpsites due to the disposal of batteries, paints containers, plastics, papers etc. Cu and Zinc are least offensive as they are essentially trace element found in excess while cadmium (Cd), chromium (Cr) and Hg are taken up by plants and can enter the food chain (Kiely, 1998; Richard, n.d., Praveena *et al.*, 2016). However, Pb, Cd and Hg are toxic to living organism even at low concentrations. At higher concentration, it can cause anomalies in metabolic function. In the present study, the high value of Cd was recorded in an active RIWAMA dumping site at Aluu before Checking-point, along the Tam David-West Airport Road (SS 4) in Ikwerre Local Government Area, while the high value of Pb was recorded in an active dumpsite-Mile 4 Well 10 Elijiji, Opposite C Bennett Specialist Hospital, Rumueme in Obio/Akpor Local Government Area (SS 1), and the high concentration of Zn was recorded closed to Jephthah Comprehensive School along East-West Road (SS C) in Obio/Apor Local Government Area. High concentration of Cu was recorded in an active waste dumpsite at Mile 4 Apra Well 10 Elijiji, Opposite C Bennett Specialist Hospital (Ss1).

In this study however, some of the heavy metal characteristics appeared in such a decreasing manner as $Mg < Pb < Zn < Mn < Fe$ having a corresponding mean concentration as $60.43 \pm 5.01 < 68.34 \pm 53.80 < 71.09 \pm 29.79 < 270.40 \pm 18.24 < 14715.12 \pm 2108.03$, respectively. The marked spatial edaphic parameters of the heavy metals reflect varying sources of waste materials disposed unregulated in the soil. Iron (Fe) and Manganese (Mn) are higher and comparable to that of Praveena *et al.*, (2016) in Greater Visakhapatnam, Southern India, and Marcus *et al.*, (2017) in Port Harcourt South-south Nigeria. Elsewhere, values were higher than the works by Thelma *et al.*, (2020) and slightly moderate to the work by Ozoekwe *et al.*, (2020). The high value of Iron (Fe) (14715.12) mg/kg in this study could be due to the organic matter from the waste which makes it more readily available.

For the groundwater, the mean value of Iron (Fe) content 0.34 ± 0.12 mg/L is considered desirable in line with the WHO (2008) most desirable and high permissive limit for groundwater. This concentration level for Fe might be due to the oxidation intensity in the system in which it occurs or the pH and is likely to exert a strong influence. This is in line with the study by Ngah and Nwankwoala (2013). The inorganic contaminants such as Cu, Ni, As, Zn, Hg, Cd, Mg, Pb, and Mn have differential in their values. Most of these heavy metals commonly occur in nature and often end up in our surface and groundwater. Some occur because of anthropogenic pollution (perchlorate, nitrates etc.). They exhibit both adverse and beneficial effects on health. Some impact on colour, odour and taste of our drinking water (AWWA, 2021). However, the mean values of copper (0.00 ± 0.00) mg/L, Nickel (0.01 ± 0.00) mg/L, Zinc (0.02 ± 0.00) mg/L, Arsenic (0.00 ± 0.00) mg/L, Mercury (0.00 ± 0.00) mg/L, Lead (0.00 ± 0.00) mg/L, Cadmium (0.00 ± 0.00) mg/L, Magnesium (0.29 ± 0.07) mg/L and Manganese (0.04 ± 0.01) mg/L respectively were found to be within the WHO (2004) and the NSDWQ (2007) regulation limits.

In accessing the knowledge, attitude and perception of waste management practices and patterns in Port Harcourt and its environs using the questionnaire, using the questionnaire unveiled that the current waste management practice in Port Harcourt and its environment is poor and comparable to the work carried out by Elenwo (2015) in Port Harcourt South-south Nigeria and Adogu *et al.*, (2015) in Owerri Southeast Nigeria. This is because households managed their wastes. This may have contributed majorly to the incessant and unregulated disposal of waste at any blind alley, service drains, open dumping, littering of refuse along some majors and the

dumping of waste at the median of most major roads within Port Harcourt and its environs. Waste handling and disposal practices by private and government agents are not encouraging as there is poor waste management infrastructure, poor waste collection and transportation system etc. The general perception of the people is that waste management is the sole responsibility of the governments hence the observed indiscriminate disposal attitudinally even though they are not ignorance of the impact it will exert on the health man and his environment.

Conclusion

Soil pH was alkaline in composition as opposed to acidic groundwater composition, which proposes that groundwater acidity is principally from acid rain. At SS1 (6.53) and SS5 (6.65) pH was slightly acidic while at SS2 (7.49), SS3 (7.36) and SS4 (7.15) it was slightly alkaline. In the groundwater, minimum pH across sampling station was 5.05 while it maximum was 5.99 defining acidic medium during the dry season. Conclusively, it could be summarized that:

1. The BOD, TSS, T. Hardness, TDS, Temperature and EC concentration regime of this study falls within the permissible limit of world Health Organization and the National Standard for Drinking Water Quality.
2. The heavy metals content in this study were found to be within the regulatory permissive limits except that of iron.
3. Iron (Fe) concentration in all the sampling stations [SS1(15181.77) mg/kg, SS2(10732.87) mg/kg, SS3(25262.64) mg/kg and SS4 (14700.09) mg/kg] was observed to be slightly elevated above regulatory standard except at SS5 (7707.23) mg/kg.
4. The pollution index of Copper (Cu) in GW4 (6.00E+1), Fe in GW1(3.31E+1) and GW2 (1.00E+1), and Mn in GW2 (1.24E+1) were higher than unity during the wet season while in the dry season, the concentration of Fe in GW1 (3.21E+1) and GW3 (1.84E+1) were higher than unity.
5. Households are responsible for the management of their waste and most of the streets in Port Harcourt do not have designated waste collection centres.
6. Most the residents dispose their waste into sanitary drains and at median of major roads.

Recommendations

Consequent upon the finding in this the research, the following recommendations are made:

1. There should be an environmental management system (EMS) comprising of technocrats in RIWAMA i.e., a database system which integrates procedures and practices for training of personnel, monitoring, summarizing, and reporting of specialized environmental performance information to internal and external stakeholders of the organization.
2. There should be a legal regime for the enforcement of all waste management laws in Port Harcourt and its environs.
3. Groundwater for public consumption should undergo physical, bacteriological and chemical treatment.
4. There should be zero tolerance for indiscriminate waste disposal at all spheres of live in Port Harcourt and its environ.
5. There should be designated waste collection centers in every street to cushion the effect of indiscriminate disposal.
6. There should be a strong legal regime to enforce the extant environmental laws as it affects waste management.
7. There should be provision of waste management infrastructure at all levels of the process.

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INFLUENCE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON UNDERGRADUATE STUDENTS IN IGNATIUS AJURU UNIVERSITY OF EDUCATION PORT HARCOURT, RIVERS STATE

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Abstract

The study examines various ways ICT influences the learning activities of students and lecturers in higher institutions. The study adopted descriptive survey research design. Two research questions and two research hypotheses were used to guide the study. The population of the study comprised of all students, and lecturers in Ignatius Ajuru University of Education Port Harcourt, Rivers State. A simple random sampling technique was used to select four hundred and fifty (450) respondents from the Ignatius Ajuru University of Education that is; two hundred and twenty-five (225) undergraduate students and two hundred and twenty-five (225) lecturers. Two research instruments; Students' influence on ICT Questionnaire (SICTQ) and lecturers' influence on ICT Questionnaire (LICTQ) were used for data collection. The reliability of the instrument was ascertained using Cronbach Alpha reliability coefficients which were .80 and .81. Mean and standard deviation was used to answer research questions while one-way analysis of variance (ANOVA) was used to answer hypotheses tested at a 0.05 level of significance. From the results, it was concluded there is no significant influence of information and communication technology of male and female students in Ignatius Ajuru University of Education in Port Harcourt. **The study also concluded that** there is no significant influence of information and communication technology on male and female lecturers in Ignatius Ajuru University of Education Port Harcourt. **Based on the finding, it was recommended** that management of Ignatius Ajuru University of Education in Port Harcourt should endeavour to grant access to students to available internet network on campus as it will motivate the students to do their assignment using materials online. It was again, recommended that outdated ICT facilities and equipment should be replaced with modern technology.

Keywords: influence, information, communication, technology

Introduction

Education in the world over today largely depends on Information and communication technology (ICT) for quantity and quality manpower for every facet of the labour market (FRN, 2004). With the prevalence and rapid growth of ICT in Nigeria today, job expectancies are getting higher and more sophisticated. In answer to these challenges, stakeholders in education currently, are emphasizing the integration of ICT hence, its potentials at all levels of education. Tertiary institutions are repositories of valuable human capitals and are intended to make an optimum contribution to national development by:

- a. intensifying and diversifying its programmes for the development of high-level manpower within the context of the needs of the nation.
- b. making professional course contents to reflect our national requirements.

c. making all students, as part of a general programme for all-round improvement in university education, offer general study courses such as the history of ideal, philosophy of knowledge and nationalism (FRN, 2004).

Information and communications technology (ICT) skills relate to one's capability to converse with people through various technologies. It is the technology used for regular and everyday tasks; sending an email, making a video call, searching the internet, using a tablet or mobile phone, and more. ICT skills could also include the ability to use older communication technologies such as telephones, radios, and televisions.

Generally, ICT experts are called upon to integrate old communication technology with the new technology. Almost every job requires some ICT skills, and many require hybrid skills, a skill set that is a mix of technical and non-technical skills. Information and communication technology types include email management and setup, online research, social media management, online collaboration, data management and queries, desktop publishing, smartphones and tablets etc.

Information and Communication Technology (ICT) is a 21st-century deducing educational reforms and an integrative part of national education policies and plans in Nigerian tertiary institutions (Achimugu et al., 2010). Desai (2010) opines that ICT is made up of different technologies delimited by their applicable usage in information access and communication of which one avatar is the internet. It is a general name for all communication device or application including radio, television, cellular phones, power-point, slides, computer networks, hardware, software, and electronic mail, facsimile, satellite systems, as well as the various services and applications associated with them (Adomi & Kpangban, 2010). Countries that have adopted and applied ICT to their operations in education and other sectors have witnessed dramatic improvement in their development efforts for instance Singapore, United States, Canada, Japan and most European nations. It has become a strong tool for sustainable development and improving governance, widening democratic space, increasing productivity, administrative effectiveness and cost savings (Adamali, Coffey & Safdar, 2006). Driven by globalization, accelerating shift to high-technology and information and communication technology economies and pressures to teach and train knowledgeable, skilled and competitive professionals, tertiary education is facing a huge challenge to increased accessibility, effectiveness and efficiency in information and communication technology.

It is a generally known fact that information and communication technology (ICT) can be used to enhance the quality of teaching and learning in tertiary institutions. Based on this, information and communication technology are gaining prominence and becoming one of the most burning elements to defining the basic competencies of students in this 21st century (Adeyemo, 2010; Nwabueze & Ozioko, 2011). Melamed and Salant (2010) identified five major skills enhanced by ICT as follows:

- information skills (literacy) which relate to the ability to gather, edit, analyze, process and connect information,
- higher-order thinking skills in particular problem-solving, critical thinking, creative and entrepreneurial thinking,
- communication and cooperation skills which are the ability to work in a team and to belong to various communities,
- skill to use technology tools and learning skills, in particular, the development of autonomous learning, self-directed learning skills.

The proficiency in performing an activity, the ability to use tools and technical equipment for the teaching, distributing and transferring knowledge is the skills and knowledge of information and communication technology (ICT) (Selvi, 2006). Independent learning is a product of self-directed learning ability that enables students to prioritize what they need to learn, chose the resources they

will consult, work collaboratively with course-mates, and organize their efforts to address learning issues in sufficient depth (Achuonye, 2012). Yusuf (2005) and David (2005) have shown in different studies that the appropriate use of ICT can bring about an outstanding change in both content and pedagogy that is at the heart of education reform in the 21st century and promotes:

- Active learning: Learners learn as they do and, whenever appropriate, work on real-life problems in-depth, making learning less abstract and more relevant to the learner's life situation; students become more aware of how to learn, Collaborative learning: positive relationship, interaction and cooperation, better communication and access to information. among students, lecturers, and experts regardless of where they are, Creative Learning: manipulation of existing information and the creation of real-world products rather than the regurgitation of received information, enhanced students' curiosity and motivation that in turn force lecturers to seek more knowledge; such competencies learnt by using ICT prepare undergraduates better for further education and in future work.
- Integrative learning: a thematic, integrative approach to teaching and learning, eliminating the artificial separation between different disciplines and between theory and practice that characterizes the traditional classroom approach and
- Evaluative learning: student-directed and diagnostic, devoid of static, text- or print-based educational technologies, allowing learners to explore and discover rather than merely listen and remember.

Tinio, (2002) indicated that information and communication technology (ICT) is a possible powerful tool for extending educational opportunities, both formal and non-formal to previously underserved constituencies in scattered and rural populations. Groups traditionally excluded from education due to cultural or social reasons such as ethnic minorities, girls and women, persons with disabilities, and the elderly, as well as all others who for reasons of cost or because of time constraints are unable to enroll on campus. Hence, information and communication technology (ICT), despite some disadvantages, provides education anytime, anywhere, transcends time and space through online course materials, accessed at all times. Teachers and learners no longer have to rely solely on printed books and other materials in physical media housed in libraries and available in limited quantities for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and a variety of media can now be accessed from anywhere at any time of the day and by an unlimited number of people. This is particularly significant for many schools in developing countries, and even some in developed countries, that have limited and outdated library resources. ICT also facilitate access to resource persons- mentors, experts, researchers, professionals, business leaders, and peers all over the world.

This study was conducted to ascertain the various ways ICT is;

1. influencing the activities of students at the tertiary level
2. influencing lecturers in higher institutions

Statement of the Problem

Most study initiatives on Information and Communication Technology (ICT) in Tertiary institutions tend to concentrate on foreign standards and utilization of ICT for instructional designs only (The Commonwealth of Learning, 2006; Becta, 2004; Akale, 2003). This emphasis on instructional use of Information and Communication Technology (ICT) in education has a prototype as educational interest in technology has always bothered on the instructional application of such technology to improve classroom instruction. Howbeit, university activity is not just about teaching and learning, rather it includes other facets such as social, political, and economic activities. These aspects of human life are in continuous interactions with and affecting each other. These activities involve students, lecturers and non-teaching members of the university who are

part of the system. The activities appear to influence the students and lecturers hence, many stakeholders are bothered about the influence of these activities. Many stakeholders have been bothered on the influence of ICT on both students and lecturers as the influence appear fragmental hence, the major crux of this study.

Research Questions

Two research questions were answered.

1. How is ICT influencing students' activities in Ignatius Ajuru University of Education in Port Harcourt?
2. In what areas is ICT influencing academic lecturers of higher institutions in Ignatius Ajuru University of Education in Port Harcourt?

Hypotheses

1. There is no significant difference in mean scores of male and female students and lecturers on the influence of information and communication technology of male and female students in Ignatius Ajuru University of Education in Port Harcourt.
2. There is no significant difference in mean scores of male and female students and lecturers on the influence of information and communication technology in Ignatius Ajuru University of Education in Port Harcourt?

Methods

The study adopted a descriptive survey design to ascertain both the positive and negative influence of information and communication technology (ICT) in Ignatius Ajuru University of Education in Port Harcourt. The population of the study comprised of all students, and lecturers in Ignatius Ajuru University of Education in Port Harcourt, Rivers State. A simple random sampling technique was used to select four hundred and fifty (450) respondents from Ignatius Ajuru University of Education [(225) undergraduate students and two hundred and (225) lecturers.]

Two research instruments targeted the students and lecturers; Students' influence of ICT Questionnaire (SIICTQ) and lecturers' Influence on ICT Questionnaire (LIICTQ). The instrument was divided into sections A and B. Section A dealt with the demographic data. Section B with two different sets of items (24 and 19) christened "influence of ICT on students Questionnaire (IICTSQ) and IITLQ with 19 and 24 items respectively served as instrument for the study.

The instruments were face-validated by three senior research fellows in the field of Educational Measurement and Evaluation in the Department of Educational Psychology, Guidance and Counselling, Ignatius Ajuru University of Education Port Harcourt. Their criticisms were incorporated to improve the face and content validity. The reliability of the instrument was ascertained using Cronbach Alpha; reliability coefficients of .80 and .81 were obtained. The instruments were administered through personal contacts by the researcher with three research assistance in Ignatius Ajuru University of Education Port Harcourt used to ensure a hundred per cent completion and return of the questionnaires. Mean and standard deviation were used to answer research questions while one-way analysis of variance (ANOVA) was used to answer hypotheses tested at a 0.05 level of significance.

Research Questions

Research Question 1: How is ICT influencing students' activities in Ignatius Ajuru University of Education in Port Harcourt?

Table 1: Summary of descriptive statistics (mean and standard deviation) on how ICT influences students' activities in Ignatius Ajuru University of Education in Port Harcourt

S/N	Influence of ICT on students' activities	Mean	SD	Remark
1.	Access relevant literature/Information for projects /assignments & further reading	3.25	0.70	Agreed
2.	Understand lectures and develop interest to learn more & study ahead of the class	3.06	0.73	Agreed
3.	Take more active participation in class, ask and answer questions	2.83	0.83	Agreed
4.	Record lectures on phones/laptops and use other software for private studies	3.26	0.75	Agreed
5.	Register courses and pay school fees online with little or no stress	3.34	0.68	Agreed
6.	Access their exam-results online with ease and error-free	3.16	0.76	Agreed
7.	Disseminate relevant information easily and accurately to friends and colleagues	3.27	0.66	Agreed
8.	Make friends and maintain relationships	3.31	0.73	Agreed
9.	Take active participation in social activities	3.10	0.81	Agreed
10.	ICT discourages the development and use of handwriting	2.92	0.86	Agreed
11.	it difficult for students to legibly and coherently write down their ideas because of use of ICT	3.17	0.72	Agreed
12.	Use of phones encourages examination malpractice, and other social vices	2.91	0.74	Agreed
13.	Use of ICT tools reduces sense of direct social/welfare and care for colleagues	3.03	0.78	Agreed
14.	ICT tools are relatively too expensive to purchase and manage (e.g., regular subscriptions, anti-virus, updates, etc	3.56	0.60	Agreed
15.	Phone calls, ring -tones & chatting in classrooms/exam halls are major distractions	3.52	0.66	Agreed
16.	Software and internet facilities on virtually every topic are making students lazy hindering the development of their thinking capabilities & creativity	3.48	0.62	Agreed
17.	Phone calls and text messages on the road are major distractions leading to devastating accidents	3.20	0.66	Agreed
18.	There is poor concentration in students' academic/social life due to memory overload from phone calls, internet facilities and channels on TV, etc	3.28	0.68	Agreed
19.	. ICT generally reduces personal ideas, efforts, and contributions towards work	2.88	0.84	Agreed
20.	Wrong exam -results uploaded to the web are more difficult to correct	3.25	0.64	Agreed
21.	Use of ICT is major time usurper of our era	3.16	0.55	Agreed
22.	ICT gadgets are generally fragile and heavy to carry about.	3.26	0.57	Agreed
23.	ICT gadgets fail to meet mobile needs e.g., laptops & multimedia projector for PowerPoint presentations	3.44	0.56	Agreed
24.	Internet fraud/crime is learnt and perpetrated on campuses Pornography, cultism and kidnapping thrive more as result of ICT impact	3.35	0.62	Agreed
Grand Mean		3.21	0.70	Agreed

The table above showed how ICT influenced students' activities in Ignatius Ajuru University of Education in Port Harcourt. The table showed that ICT influence students' access to relevant literature/Information for projects, assignments & further reading (Mean=3.25, SD=0.70), understand lectures and develop interest to learn more & study ahead of the class (Mean=3.06, SD=0.73), take more active participation in class, ask and answer questions (Mean=2.83, SD=0.83), record lectures on phones/laptops and use other software for private studies (Mean=3.26, SD=0.75), register courses and pay school fees online with little or no stress (Mean=3.34, SD=0.68), access their exam-results online with ease and error-free (Mean=3.16, SD=0.76), disseminate relevant information easily and accurately to friends and colleagues (Mean=3.27, SD=0.66), make friends and maintain relationships, (Mean=3.31, SD=0.73), take active participation in social activities (Mean=3.10, SD=0.81), ICT discourages the development and use of handwriting (Mean=2.92, SD=0.86), difficult for students to legibly and coherently write down their ideas because of use of ICT (Mean=3.17, SD=0.72), use of phones encourages examination malpractice, and other social vices (Mean=2.91, SD=0.74), use of ICT tools reduces sense of direct social/welfare and care for colleagues (Mean=3.03, SD=0.78), ICT tools are relatively too expensive to purchase and manage (e.g., regular subscriptions, anti-virus, updates, etc (Mean=3.56, SD=0.60), Phone calls, ring-tones & chatting in classrooms/exam halls are major distractions (Mean=3.52, SD=0.66), software and internet facilities on virtually every topic are making students lazy hindering the development of their thinking capabilities & creativity (Mean=3.48, SD=0.62), Phone calls and text messages on the road are major distractions leading to devastating accidents (Mean=3.20, SD=0.66), there is poor concentration in students' academic/social life due to memory overload from phone calls, internet facilities and channels on TV, etc. (Mean=3.28, SD=0.68), ICT generally reduces personal ideas, efforts, and contributions towards work (Mean=2.88, SD=0.84), wrong exam-results uploaded to the web are more difficult to correct (Mean=3.25, SD=0.64), use of ICT is major time usurper of our era (Mean=3.16, SD=0.55), ICT gadgets are generally fragile and heavy to carry about (Mean=3.26, SD=0.57), ICT gadgets fail to meet mobile needs e.g., laptops & multimedia projector for PowerPoint presentations (Mean=3.44, SD=0.56) and internet fraud/crime is learnt and perpetrated on campuses Pornography, cultism and kidnapping thrive more as result of ICT impact (Mean=3.35, SD=0.62) are the various influence of ICT on students' activities.

Research Question 2: In what areas is ICT influence academic lecturers of higher institutions in Ignatius Ajuru University of Education in Port Harcourt?

Table 2: Summary of descriptive statistics (mean and standard deviation) on areas is ICT affecting academic lecturers of higher institutions in Ignatius Ajuru University of Education in Port Harcourt

S/N	Areas ICT is affecting academic lecturers	Mean	SD	Remark
25	ICT boosts research work through rich and up-to-date literature review	3.16	0.83	Agreed
26.	ICT gadgets are generally fragile and heavy to carry about	3.10	0.68	Agreed
27.	ICT fail to meet mobile needs e.g., laptops & multimedia projector for PowerPoint presentations	3.28	0.55	Agreed
28.	ICT triggers international contacts for journal subscription and publication	3.12	0.66	Agreed
29.	ICT readily provides gadgets & software, making teaching and practical demonstrations easy	3.21	0.70	Agreed
30.	ICT widens professional horizon through regular updates: methods, resources, and contents	3.19	0.74	Agreed
31.	Software and internet facilities on virtually every topic are making lecturers lazy hindering the development of their thinking capabilities & creativity	3.08	0.72	Agreed
32.	ICT enhances professional linkage and collaboration beyond the local boundaries	3.26	0.65	Agreed
33.	ICT enhances teacher-learner relationship through steady communication	3.28	0.73	Agreed
34.	ICT promotes both local and international relationships among colleagues	3.02	0.59	Agreed
35.	Phone calls are major sources of distractions during lectures/examination sessions	3.08	0.64	Agreed
36.	Phone calls and text messages on the road are major distractions leading to devastating accidents	3.09	0.60	Agreed
37.	With progress in ICT, teachers' job is highly threatened, because computers are successfully doing most of teachers' jobs	3.22	0.63	Agreed
38.	Use of ICTs is reducing people's sense of direct social/welfare and care for colleagues	3.23	0.70	Agreed
39.	ICT generally reduces personal ideas, efforts, and contributions towards work	3.36	0.69	Agreed
40.	Progress in ICT is posing major challenge to face-to-face contacts	3.21	0.64	Agreed
41.	ICT gives room for students to challenge teacher's authority in class	3.00	0.71	Agreed
42.	ICT tools are relatively too expensive to purchase and manage	3.02	0.72	Agreed
43.	Plagiarism thrives more in this era of ICT			
Grand Mean		3.15	0.68	Agreed

The table above showed the areas ICT is affecting academic lecturers in Ignatius Ajuru University of Education in Port Harcourt. The table revealed that ICT boosts research work through rich and up-to-date literature review (Mean=3.16, SD=0.83), ICT gadgets are generally fragile and heavy to carry about (Mean=3.10, SD=0.68), ICT fail to meet mobile needs e.g., laptops & multimedia projector for PowerPoint presentations (Mean=3.28, SD=0.55), ICT triggers international contacts for journal subscription and publication (Mean=3.12, SD=0.66), ICT readily provides gadgets & software, making teaching and practical demonstrations easy (Mean=3.21, SD=0.70), ICT widens professional horizon through regular updates: methods, resources, and contents (Mean=3.19, SD=0.74), software and internet facilities on virtually every topic are making lecturers lazy hindering the development of their thinking capabilities & creativity (Mean=3.08, SD=0.72), ICT enhances professional linkage and collaboration beyond the local boundaries (Mean=3.26, SD=0.65), ICT enhances teacher-learner relationship through steady communication (Mean=3.28, SD=0.73), ICT promotes both local and international relationships among colleagues (Mean=3.02, SD=0.59), Phone calls are major sources of distractions during lectures/examination sessions (Mean=3.08, SD=0.64), Phone calls and text messages on the road are major distractions leading to devastating accidents (Mean=3.09, SD=0.60), with progress in ICT, teachers' job is highly threatened, because computers are successfully doing most of teachers' jobs (Mean=3.22, SD=0.63), use of ICTs is reducing people's sense of direct social/welfare and care for colleagues (Mean=3.23, SD=0.70), ICT generally reduces personal ideas, efforts, and contributions towards work (Mean=3.36, SD=0.69), progress in ICT is posing major challenge to face-to-face contacts (Mean=3.21, SD=0.64), ICT gives room for students to challenge teacher's authority in class (Mean=3.00, SD=0.71) and ICT tools are relatively too expensive to purchase and manage (Mean=3.02, SD=0.72) are the various areas ICT affecting academic lecturers of higher institutions in Ignatius Ajuru University of Education in Port Harcourt.

Hypotheses

HO1: There is no significant difference between the mean scores of male and female students and lecturers on the influence of information and communication technology in Ignatius Ajuru University of Education in Port Harcourt.

Table 3: Summary of t-test on the difference between the mean rating of male and female students on the influence of information and communication technology on students in Ignatius Ajuru University of Education in Port Harcourt.

Students	N	Mean	SD	Mean Difference	Df	T-test	Sig.	Remark
Male	161	3.84	0.79	0.28 (0.32)	263	1.189	0.231	NS
Female	64	3.56	0.47					

NS=Significant difference

The data in table 3 above showed that the mean significance difference between the mean rating of male and female students on the influence of information and communication technology on students in Ignatius Ajuru University of Education in Port Harcourt is (**Mean=0.28, SD=0.32**). Also, there is no significant significance influence of information and communication technology

on students in Ignatius Ajuru University of Education in Port Harcourt ($t_{223,0.05}=1.189$, $\text{Sig.}=0.231$). Hence, the null hypotheses one is rejected.

HO2: There is no significant difference between the mean scores of male and female students and lecturers on the influence of information and communication technology in Ignatius Ajuru University of Education in Port Harcourt?

Table 4: Summary of t-test on the difference between the mean rating of male and female students on the influence of information and communication technology on students in Ignatius Ajuru University of Education in Port Harcourt

Lecturer	N	Mean	SD	Mean Difference	Df	T-test	Sig.	Remark
Male	120	3.11	1.00	0.02 (0.64)	263	0.997	0.098	NS
Female	145	3.13	0.36					

NS=Significant difference

The data in table 4 above showed that the mean significance difference between on the mean rating of male and female lecturers on the influence of information and communication technology in Ignatius Ajuru University of Education in Port Harcourt is (**Mean=0.02, SD=0.64**). Also, there is no significant significance influence of information and communication technology on students in Ignatius Ajuru University of Education in Port Harcourt ($t_{223,0.05}=0.997$, $\text{Sig.}=0.098$). Hence, the null hypotheses two is rejected.

Discussion of Findings

Information and communication technology and students

ICT influence students' access relevant literature/Information for projects /assignments & further reading, understand lectures and develop interest to learn more & study ahead of the class, take more active participation in class, ask and answer questions, record lectures on phones/laptops and use other software for private studies, register courses and pay school fees online with little or no stress, access their exam-results online with ease and error-free, disseminate relevant information easily and accurately to friends and colleagues, make friends and maintain relationships, take active participation in social activities, ICT discourages the development and use of handwriting, difficult for students to legibly and coherently write down their ideas because of use of ICT, use of phones encourages examination malpractice, and other social vices, use of ICT tools reduces sense of direct social/welfare and care for colleagues, ICT tools are relatively too expensive to purchase and manage (e.g., regular subscriptions, anti-virus, updates, etc, Phone calls, ring-tones & chatting in classrooms/exam halls are major distractions, software and internet facilities on virtually every topic are making students lazy hindering the development of their thinking capabilities & creativity, phone calls and text messages on the road are major distractions leading to devastating accidents, there is poor concentration in students' academic/social life due to memory overload from phone calls, internet facilities and channels on TV, etc, ICT generally reduces personal ideas, efforts, and contributions towards work, wrong exam-results uploaded to the web are more difficult to correct, use of ICT is major time usurper of our era, ICT gadgets are generally fragile and heavy to carry about, ICT gadgets fail to meet mobile needs e.g., laptops & multimedia projector for PowerPoint

presentations and internet fraud/crime is learnt and perpetrated on campuses. Pornography, cultism and kidnapping thrive more as result of ICT impact are the various influence of ICT on students' activities. There is no significant influence of information and communication technology of male and female students in Ignatius Ajuru University of Education in Port Harcourt. The result of the study contradicts Edem, (2014) who reported that males were found to be more productive using ICT than females' counterparts in academic publications. It also contradicts the finding of Drup, (2015) who found that males used ICT more than females.

Information and communication technology and lecturers

ICT boosts research work through rich and up-to-date literature review, ICT gadgets are generally fragile and heavy to carry about, ICT fail to meet mobile needs e.g., laptops & multimedia projector for PowerPoint presentations, ICT triggers international contacts for journal subscription and publication, ICT readily provides gadgets & software, making teaching and practical demonstrations easy, ICT widens professional horizon through regular updates: methods, resources, and contents, software and internet facilities on virtually every topic are making lecturers lazy hindering the development of their thinking capabilities & creativity ICT enhances professional linkage and collaboration beyond the local boundaries, ICT enhances teacher-learner relationship through steady communication, ICT promotes both local and international relationships among colleagues, phone calls are major sources of distractions during lectures/examination sessions, phone calls and text messages on the road are major distractions leading to devastating accidents, with progress in ICT, teachers' job is highly threatened, because computers are successfully doing most of teachers' jobs, use of ICTs is reducing people's sense of direct social/welfare and care for colleagues, ICT generally reduces personal ideas, efforts, and contributions towards work, progress in ICT is posing major challenge to face-to-face contacts, ICT gives room for students to challenge teacher's authority in class and ICT tools are relatively too expensive to purchase and manage. There is no significant influence of information and communication technology on male and female lecturers in Ignatius Ajuru University of Education in Port Harcourt. The findings of the study are in agreement with the studies of Koohang, (2016) that there is no significant difference between gender of lecturers and their use of ICT. This is supported by Poopola (2012) who also reported a correlation between gender and level of computer anxiety.

Conclusion

Based on the findings of the study, it is concluded that information and communication technology (ICT) influenced both genders of lecturers and students' activities in Ignatius Ajuru University of Education in Port Harcourt hence there is no significant influence of information and communication technology on both genders of lecturers and students in Ignatius Ajuru University of Education in Port Harcourt.

Recommendations

It is therefore recommended based of the findings of the study that;

1. The management of Ignatius Ajuru University of Education in Port Harcourt should endeavour to grant access to students to available internet network on campus. This will motivate the students to do their assignment using materials online.
2. Outdated ICT facilities and equipment should be replaced with modern technology.
3. Staff and students in Ignatius Ajuru University of Education in Port Harcourt should be encouraged to acquire the necessary skills to operate and use ICT facilities and equipment in carrying out e-learning.

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CAUSES AND EFFECTS OF CONFLICTS AMONG STAFF AND MANAGEMENT OF COLLEGE OF HEALTH SCIENCE AND MANAGEMENT, RIVERS STATE, NIGERIA

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Abstract

The study examines the causes of conflicts in Rivers State College of Health Science and Management Port Harcourt and to ascertain the effects of the conflicts Rivers State College of Health Science and Management Port Harcourt, Nigeria. The study adopted descriptive research design. Two research questions and two research hypotheses were used to guide the study. The study population is the entire staff of Rivers State College of Health Science and Management Technology, Port Harcourt both teaching and non-teaching staff. A simple random sampling technique was used to select one hundred and sixty-five (165) staff from the population. The instrument for data collection is the Effect and Cause of Conflict Questionnaire (ECCQ) prepared by the researcher. Split-half was used to establish the reliability index 0.81. The research questions were answered using mean and standard deviation while the hypotheses were tested at 0.05 level of significance using independent t-test. From the results, it was concluded that there is no significant difference between perceptions of teaching and non-teaching staffs on the cause and effects of conflict in Rivers State College of Health Science and Management Technology Port Harcourt. The study also concluded that there is no significant difference between perceptions of teaching and non-teaching staffs on the types of conflict in Rivers State College of Health Science and Management Technology, Port Harcourt. Based on the finding, it was recommended that there should be adequate conflict and resolution management mechanism in Rivers State College of Health Science and Management Technology Port Harcourt to reduce conflicts and enhance productivity in the college. It was also recommended that there should be effective communication channel and adequate human relation in Rivers State College of Health Science and Management Technology Port Harcourt to create room for negotiation as at when necessary.

Keywords: causes, effect, conflict, management

Introduction

Conflict is unexceptional and inevitable in every sphere of life especially, in a public place, where people of different characters, cultural backgrounds, and interests exist together to achieve one common organizational or individual goal. Individual or group objectives may differ and in attempting to achieve any objective either collectively or individually many will certainly result in defrocking others of their interests hence, causing conflict in an organization (Oudeh, 2014). However, conflict is a necessity in the workplace, serving as a tool to checkmate the activities of the organizational functionaries, against the emergence of autocratic principles and create an enabling environment for effective cooperation among individuals and groups in the organization (Pondy, 2002). Henry, (2009) reported that conflict in an organization is the dispute caused as a result of incompatibility of people's interests, objectives, goals, and values in the workplace. Tjosvold (2008) affirmed that conflict is necessary and inevitable in an environment where people's

discipline and understanding coexist and it is not opposition to management interest, but another mechanism that can stimulate cooperation between staff and management in an organization. Every organization is structurally centralized such that staff is represented by the labor union while the employer is represented by the management. While determining the employment relationship and working conditions in the organization will result in the centralization of interests, values, and application of different strategies to achieve set goals in the organization. Ubeku, (2008) reported that conflict is a product of continuous interactions between individuals in an organization, between staff and management, or group and individuals. These reciprocal actions sometimes result in conflict as a result of the clash of interests or inability to secure each other's interests. Sometimes, the management may find it hard to meet up with the demands of labor unions (staff) and this failure in an organization also results in conflict. According to Adewole and Adebola (2010), organizational conflict is the clash that happened in a workplace when the goals, interests, or values of different individuals or groups are noncombustible and those involved block or frustrate each other's attempts to achieve their objectives. Considering the above, Igbaji (2009) stated that agitation by staff (labor union) in Nigeria for improved conditions of service and other welfare packages are always not in consonance with the interests and expectations of college management hence, resulting in constant conflict among staff and college management. To worsen the matter, the workers' rights and interests in the college may be neglected by the asymmetrical power relations between management and labor unions (staff). The erratic power centralization between the staff and management gives management the advantage which deprives staff (labor union) of their welfare demands. This prompts the workers to resort to confrontations, strikes, and industrial conflict to drive home their demands. The issues of industrial conflicts have become a recurrent event in Nigerian public institutions, including health institutions. This scenario is common in the public institutions, otherwise called government institutions in Rivers State, with its grievous consequences on all stakeholders (employees, management, and students).

Generally, in an organization, conflicts arise as a result of the clash of interests between individuals or groups as they pursue a particular objective. Conflict is normal and inevitable in human life, and therefore cannot be completely avoided in human relations. It could be destructive as well as productive in an organization. Hotepo, Asokere, Abdul-Azeez, and Ajemunighbhum, (2010) argued that conflict is negative when it creates resistance to change, establishes turmoil, factors in distrust, builds a feeling of defeat, or widens clash of misunderstanding. Furthermore, Hotepo et al (2010) also reported that conflict is regarded as productive when it encourages creativity, new looks at old conditions, the clarification of points of view, and the development of human capabilities to handle interpersonal differences. Otite, (2001) and Ajala, (2003) corroborated with the above views on conflict and added that conflict is a normal part of organizational life and is used as a way of settling problems originating from opposing interests for the continuity of the society. Given the above, the study tends to define conflict as a disagreement arising from different perceptions and interests of individuals and groups while allocating specific resources in the organization. However, conflict could be managed and when adequately resolved, it creates an opportunity to widen the scope of knowledge on challenging issues and make groups or individuals learn from each other and provide solutions to the identified problem. Again, when the same conflict is not adequately controlled, it results in the breakdown of staff and management relationships and leads to several negative effects on organizational management, employees, and the state which leads to labour union strikes. According to Onyeonoru, (2005) organizational conflict means all expressions of dissatisfaction within the employment contract and effort of bargaining. Kornhauser, Dubin, and Rose. (2004) saw conflict as the total behaviour and attitudes that express opposition and divergent orientation between staff, management, and the government at different points. To Kornhauser et al (2004), emphases are on the fact that it is peculiar to organizations. Such conflicts

involve disagreements and a clash of interest between the employees and employers, staff, and management on issues of conditions of service. Otobo, (2000) further reiterated that industrial conflicts reflect the height of the inability of the parties involved, staff, management, and even the government to reach an agreement on any issue connected with the subject of employer-employees interaction. From the above views, the study tends to establish that the main stakeholders involved in the conflict in the college of Health science and management in Rivers State are the staff, management, and the government, student, conflicts arise as a result of the inability of the parties to consent to each other's demand. Donais, (2006) reported that conflict is normal in an organization and its effects produce disputes resulting in low productivity as well as cooperation between different parties in the environment.

This study is anchored on conflict theory. Karl Marx is the originator of Conflict theory and is associated with the Marxian scholars. It is a sociological theory that emphasizes the socio-political and material inequality of social groups and individuals in society. The theory explains the role of power and its differentials and material dialectics in society. According to Marx cited in Donais, (2006), society is stratified into two groups; a ruling class and a subject class. The ruling class derives power from the ownership and control of the forces of production which is used to exploit and oppress the subject class. The inequality in the relationship between the ruling and subject classes results in a conflict of interest. Marx further explained class as a group of individuals who share similar positions in the market economy and as a result receive similar economic rewards. Counting on the views of Marx, Crossman, (2014) stated that conflict theory explains the role of coercion and power in producing social order. Social order is maintained by domination with power in the hands of those who possess great political and economic resources in society. Inequality exists since those in control of a disproportionate share of the resources actively protect their resources and positions, leaving the masses (subject class) without an adequate share.

Thus, the masses persistently pursue change in the system to enable them to partake in the value. In the view of Oudeh, (2014), conflicts arise due to the differences in wants, needs, or expectations in an organization. Thus, individuals and groups in organizations such as Rivers State college of health science and management are bound to have and pursue different wants, needs, and expectations.

The objectives of the study Specifically are to examine the causes of conflicts in Rivers State College of Health Science and Management Port Harcourt and to ascertain the effects of the conflicts Rivers State College of Health Science and Management Port Harcourt, Nigeria.

Statement of problem

In an organization where people interact with other-individuals or groups, there is bound to be conflict arising from differences in perception, behaviour, interest, needs, and approach of matters. This threatens the peaceful coexistence of staff and management and affects the productivities of the college to the detriment of the students. The organization of professionals involved the use of a hierarchy with the management in a command position. Now it routinely combines the efforts of the management of different staff, Deans, Heads of Departments in the team. Relationships between staff and management are in their nature unequal, differences in knowledge and experience in specific issues confer on those who possess them, unequal responsibility and authority both ethically and legally and precisely because of this inequality of authority and responsibility. Ogbonnaya et al. (2007) staff and management conflicts are common and expected among all members of the college community, the staff both academic and non-academic. Management staff who occupy a pre-eminent position enjoys a higher degree of autonomy, responsibility, authority, and social status than any other staff. This is because they are largely responsible for the making of decisions in the college and of which staff depends on them. Most

importantly, the policies governing the practice of the college put the management at the helm of the affairs. Historically, conflict occurs between labor unions and management. Sources of conflict include lack of definition of the appropriate level of autonomy for team members, lack of constructive dialogue across perceived discipline-based differences of opinion, lack of knowledge of the expertise of other staff, and a large lack of proper communication between staff and management. In Rivers State, other sources of conflict identified include societal pressure on workers including, low morale of workers due to harsh economic realities, communication gap amongst management and commissions of government and its agencies within the educational and health sectors. Is the differential treatment of staff or labor union responsible for this conflict? Are the other staff envious of the management? Do management in any way act in ways that intimidate or discriminate against the other staff? It is important to ascertain the perceptions of the staff on what causes conflict for a viable solution to be fashioned out. Moreover, experience is not finite but fluid, it is thus necessary for a reevaluation over time. This study, therefore, adopted a descriptive research design to explore the causes and effects of conflict in Rivers State College of health science and management Port Harcourt.

Research Question

The following research questions were answered;

1. What is staff perception on the causes and effects of conflict in Rivers State college of health science and management Port Harcourt?
2. What are the perceptions of staff on the types of conflict in Rivers State college of health science and management Port Harcourt?

Hypotheses

1. There is no significant difference between the mean scores of teaching staff and non-teaching staff on the influence of conflict in Rivers State college of health science and management, Port Harcourt.
2. There is no significance difference between the perceptions of teaching and non-teaching staffs on the types of conflict in Rivers State College of health science and management and technology Port Harcourt.

Methods

The study population is the entire staff of Rivers State college Health Science and Management Port Harcourt both teaching and non-teaching staff. therefore, the study population one hundred and eight one (181) staff, that is one hundred and twenty-one (121) teaching staff and sixty non-teaching staff. A simple random sampling technique was used to select one hundred and sixty-five (165) staff from the population. Proportional sampling technique was used to select a proportion of one hundred and twenty (120) teaching staff and forty-five (45) non-teaching staff that; .

The instrument for data collection is the Effect and Cause of Conflict Questionnaire (ECCQ) prepared by the researcher. The instrument is divided into two sections; section A contains the bio-data of the staff while section B contains twenty-two items. The face validity of the instrument Effect and Cause of Conflict Questionnaire (ECCQ) was validated through moderation by different expertise in questionnaire construction and content specialists. Through simple random sampling, forty staff were drawn from Rivers State University Port Harcourt for trial testing. The split-half method was used to establish the reliability of the instrument (ECCQ), and a reliability coefficient of .81 was obtained using the Spearman-Brown prophecy formula. Research question 1 and 2 was answered using mean and standard deviation while independent t-test was used to answer hypothesis 3.

Research Questions

Research Question 1: What is staff perception on the causes and effects of conflict in Rivers State College of Health Science and Management and Technology Port Harcourt?

Table 1: Summary of descriptive statistics (mean and standard deviation) on the staff perception on the causes and effects of conflict in Rivers State College of Health Science and Management and Technology Port Harcourt

S/N	Causes and effects of conflict	Mean	SD	Remark
1.	There is always poor communication from management to staff	3.26	0.70	Agreed
2.	There are sanctions on Union activities by the Management at times	3.06	0.73	Agreed
3.	There are scarce resources in the college sometimes	2.81	0.84	Agreed
4.	There is always Personality clash	3.23	0.76	Agreed
5.	Different values and orientation may result to conflict	3.34	0.67	Agreed
6.	There are poor management policies on staff matters	3.15	0.78	Agreed
7.	Non implementation of service circulars	3.27	0.65	Agreed
8.	Inadequate office facility	3.31	0.72	Agreed
9.	Non-Payment of Arrears	3.09	0.82	Agreed
10.	Wastage of economic resources	2.89	0.87	Agreed
11.	Loss of life	3.18	0.73	Agreed
12.	Low productivity	2.90	0.74	Agreed
13.	Strained relationship	3.04	0.77	Agreed
14.	Poor international image	3.56	0.59	Agreed
15.	Stress and frustration	3.52	0.65	Agreed
16.	Wastage of time resources	3.48	0.62	Agreed
17.	Sabotage /loss of	3.22	0.66	Agreed
18.	Absence to duty	3.26	0.68	Agreed
19.	Grievances and litigations	2.87	0.84	Agreed
Grand Mean		3.18	0.73	Agreed

Table 1 showed the staff perception on the causes and effects of conflict in Rivers State College of health science and management and technology Port Harcourt. The table above showed that poor communication from management to staff (Mean=3.26, SD=0.70), sanctions on Union activities by the Management at times (Mean=3.06, SD=0.73), are scarce resources in the college sometimes (Mean=2.81, SD=0.84), personality clash (Mean=3.23, SD=0.76), different values and orientation may result to conflict (Mean=3.34, SD=0.67), poor management policies on staff matters (Mean=3.15, SD=0.78), non-implementation of service circulars (Mean=3.27, SD=0.65),

inadequate office facility (Mean=3.31, SD=0.72), non-Payment of Arrears (Mean=3.09, SD=0.82), wastage of economic resources (Mean=2.89, SD=0.87), loss of life (Mean=3.18, SD=0.73), low productivity (Mean=2.90, SD=0.74), strained relationship (Mean=3.04, SD=0.77), Poor international image (Mean=3.56, SD=0.59), stress and frustration (Mean=3.52, SD=0.65), wastage of time resources (Mean=3.48, SD=0.62), sabotage /loss (Mean=3.22, SD=0.66), absence to duty (Mean=3.26, SD=0.68) and grievances and litigations (Mean=2.87, SD=0.84) are the different causes and effect of conflict in Rivers State College of Health Science and Management and Technology Port Harcourt.

Research Question 2: What are the perceptions of staff on the types of conflict in Rivers State College of Health Science and Management Technology Port Harcourt?

Table 2: Summary of descriptive statistics (mean and standard deviation) on the staff perceptions of staff on the types of conflict in Rivers State College of Health Science and Management Technology Port Harcourt

S/N	Causes and effects of conflict	Mean	SD	Remark
1.	Conflict within the yourself, based on conflicting responsibilities	3.23	0.64	Agreed
2.	Conflict between you and other staff members of the schools	3.15	0.54	Agreed
3.	Conflicts between you and your superior officer (head of your department)	3.25	0.57	Agreed
4.	Conflict between you and school management policy	3.43	0.56	Agreed
5.	Conflict between school responsibility and your personal or family challenges	3.34	0.63	Agreed
	Grand Mean	3.26	0.63	Agreed

Table 2 showed the staff perception on the types of conflict in Rivers State College of health science and management and technology Port Harcourt. The table showed that there exist intrapersonal conflict based on conflicting responsibilities (Mean=3.23, SD=0.64), conflict between staff members of the schools (Mean=3.15, SD=0.54), conflicts between junior staff members and their superior officers (head of your department) (Mean=.25, SD=0.57), conflict between staff members and school management policy at times (Mean=3.43, SD=0.56), conflict between school responsibility and your personal or family challenges (Mean=3.34, SD=0.63) are the various types of conflict existing in Rivers State College of health science and management and technology Port Harcourt.

Hypotheses

HO1: There is no significance difference between perceptions of teaching and non-teaching staffs on the cause and effects of conflict in Rivers State College of Health Science and Management Technology Port Harcourt.

Table 3: Summary of t-test on the difference between perceptions of teaching and non-teaching staffs on the cause and effects of conflict in Rivers State College of Health Science and Management Technology Port Harcourt

Staff Designation	N	Mean	SD	Mean Difference	df	T-test	Sig.	Remark
Teaching Staff	120	3.19	0.79	0.02 (0.12)	263	0.549	0.584	NS
Non-academic Staff	145	3.17	0.67					

NS=Significant difference

The data in table 4.6 above showed that the mean significance difference between perceptions of teaching and non-teaching staffs on the cause and effects of conflict in Rivers State College of Health Science and Management Technology Port Harcourt is (Mean=0.02, SD=0.12). Also, there is no significant significance difference between perceptions of teaching and non-teaching staffs on the cause and effects of conflict in Rivers State College of Health Science and Management Technology Port Harcourt ($t_{263,0.05}=0.549$, Sig.=0.584). Hence, the null hypotheses one is rejected.

HO2: There is no significance difference between the perceptions of teaching and non-teaching staffs on the types of conflict in Rivers State College of health science and management and technology Port Harcourt.

Table 4: Summary of t-test on the difference between perceptions of teaching and non-teaching staffs on the types of conflict in Rivers State College of Health Science and Management Technology Port Harcourt

Staff Designation	N	Mean	SD	Mean Difference	df	T-test	Sig.	Remark
Teaching Staff	120	3.19	0.79	0.14 (0.32)	263	1.009	0.104	NS
Non-academic Staff	145	3.33	0.47					

NS=Significant difference

The data in table 4.6 above showed that the mean significance difference between perceptions of teaching and non-teaching staffs on the types of conflict in Rivers State College of Health Science and Management Technology Port Harcourt e is (Mean=0.14, SD=0.32). Also, there is no significant difference between perceptions of teaching and non-teaching staffs on the types of conflict in Rivers State College of Health Science and Management Technology Port Harcourt ($t_{263,0.05}=1.009$, Sig.=0.104). Hence, the null hypotheses two is rejected.

Discussion of Findings

Cause and effects of conflict in the higher institution

Poor communication from management to staff, sanctions on Union activities by the Management at times, are scarce resources in the college sometimes, personality clash, different values and

orientation may result to conflict, poor management policies on staff matters, non-implementation of service circulars, inadequate office, non-Payment of Arrears, wastage of economic resources, loss of life, low productivity, strained relationship, poor international image, stress and frustration, wastage of time resources, sabotage /loss, absence to duty are the different causes and effect of conflict in Rivers State College of Health Science and Management and Technology Port Harcourt but grievances and litigations which has the highest mean and standard deviation of ($M = 2.87$; $SD = 0.84$) of the responses from the staff of Rivers State college of Health Science and Management Technology which respondents considered as the major cause of conflict in the college. This finding contradicts the finding of Hotepo et al. (2010) which regards the occurrence of financial inadequacy, as a result of either poor budgetary allocation or financial misappropriation, leading to scarcity of resources with which to attend to the organizational demand, thereby resulting in conflicts. There is no significant difference between perceptions of teaching and non-teaching staffs on the cause and effects of conflict in Rivers State College of Health Science and Management Technology Port Harcourt which implies that both teaching and non-teaching staff of Rivers State College of Health Science and Management Technology Port Harcourt agreed that grievances and litigations is the major cause and effect of conflict in Rivers State College of Health Science and Management Technology Port Harcourt.

Types of conflict existing in the higher institution

There exists intrapersonal conflict based on conflicting responsibilities, conflict between staff members of the schools, conflicts between junior staff members and their superior officers (head of your department), conflict between staff members and school management policy at times, conflict between school responsibility and your personal or family challenges are the various types of conflict existing in Rivers State College of health science and management and technology Port Harcourt. Generally, all the above types of conflict exist in Rivers State College of health science and management and technology Port Harcourt. There is no significant difference between perceptions of teaching and non-teaching staffs on the types of conflict in Rivers State College of Health Science and Management Technology Port Harcourt. This means that both teaching and non-teaching staff of Rivers State College of health science and management and technology Port Harcourt agreed that these types of conflict exist.

Conclusion

Based on the results of the study, it was concluded that grievances and litigations which has the highest mean and standard deviation of ($M = 2.87$; $SD = 0.84$) of the responses from the staff of Rivers State college of Health Science and Management Technology which respondents considered as the major cause of conflict in the college. The study also concluded that There is no significant difference between perceptions of teaching and non-teaching staffs on the cause and effects of conflict in Rivers State College of Health Science and Management Technology Port Harcourt.

Again, the study equally concluded that there is intrapersonal conflict based on conflicting responsibilities, conflict between staff members of the schools, conflicts between junior staff members and their superior officers (head of your department) , conflict between staff members and school management policy at times, conflict between school responsibility and your personal or family challenges are the various types of conflict existing in Rivers State College of health science and management and technology Port Harcourt. And of course, there is no significant difference between perceptions of teaching and non-teaching staffs on the types of conflict in Rivers State College of Health Science and Management Technology Port Harcourt, the study concluded.

Recommendations

Based on findings of the study, it is recommended that:

1. There should be adequate conflict and resolution management mechanism in Rivers State College of Health Science and Management Technology Port Harcourt to reduce conflicts and enhance productivity in the college.
2. There should be effective communication channel and adequate human relation in Rivers State College of Health Science and Management Technology Port Harcourt to create room for negotiation as at when necessary.
3. There should be an increase in budgetary allocation in Rivers State College of Health Science and Management Technology Port Harcourt in order to checkmate the challenges of inadequate funds.

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GESTATIONAL AGE AND RELIGION AS CORRELATES OF EFFECTS OF HEALTH EDUCATION ON THE LEVEL OF KNOWLEDGE OF ANAEMIA PREVENTION AMONG PREGNANT WOMEN IN RIVERS EAST SENATORIAL DISTRICT OF RIVERS STATE

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Abstract

This **study investigated the** effects of gestational age and religion on the level of knowledge of anaemia prevention among pregnant women in Rivers East senatorial district of Rivers State. Two research questions were answered and two hypotheses were tested at 0.05 level of significance. A multi-stage sampling procedure was adopted to select a sample size of 600 hundred respondents for the study. Data was collected using a structured questionnaire and analysis was carried out using SPSS version 25.0. Analytical tools such as mean, standard deviation and analysis of covariance (ANCOVA) at 0.05 alpha level was employed. The findings of the study showed that effect of the intervention on the preventive behaviour was found to be significant based on religion [$F = 0.027$, $p < 0.05$]. The study concluded that, health education has a significant effect on preventive behaviour towards anaemia among pregnant women in Obio/Akpor. It was recommended among others that, maternal health care professionals including gynecologists and obstetricians should give more attention to the prevention of anaemia among the pregnant women during their antenatal visit by making information relating to it available to them.

Keywords: gestational age, religion, effects, health education, anaemia

Introduction

Health education is one of the vital strategies for the reduction of anaemia among pregnant women as it equips them with the necessary information which enhances their knowledge and preventive behaviour towards it knowing that, anaemia is one of the most frequent complications related to *pregnancy*. According to the World Health organization (WHO, 2011), anaemia is a condition in which the number of red blood cells (RBCs) or their oxygen-carrying capacity is inadequate to meet physiologic demands in the body. Anaemia may be relative or absolute. Relative anaemia is that which occurs in pregnancy while the absolute anaemia involves a true decrease in the red cell mass which are manufactured in the bone marrow and have a life expectancy of approximately four months (120 days) (Bolton et al., 2013). To prevent the red blood cells from depleting, the body needs (among other things) iron, vitamin B12 and folic acid. These nutrients requirement significantly increase during pregnancy due to the physiological changes in the woman and the increasing needs for fetal and placenta development. However, Tay et al. (2013) stated that, despite increased nutrients requirement, pregnancy is also a period of increased risk for anaemia which is higher than in non-pregnant state. Thus, conscious effort must be made for its prevention.

Globally, anaemia affects 1.62 billion people with prevalence of 24.8%, out of whom an estimated, 56 million (41.8%) of pregnant women had anaemia. The greatest burden of anaemia was borne by Asia and Africa where it was estimated that 60% and 52% of women respectively

were anaemic. In developed countries, it was estimated that, about 38% of pregnant women had iron depletion which made them anaemic (Jack & Agostino, 2014). In Nigeria, the prevalence of anaemia was reported by Nwizu et al. (2011) to be 64.7% specifically for those in the low socioeconomic class. Anaemia has been said to be responsible for 16% of maternal deaths in India, 11% in Kenya, 9% in Nigeria and 8% in Malawi. Estimates of maternal mortality from anaemia range from 34 per 100,000 live births in Nigeria to as high as 194 per 100,000 live births in Pakistan. In combination with obstetric hemorrhage, anaemia is estimated to be responsible for 17% to 46% of cases of maternal deaths. Increased risks of premature labor and low birth weight have been reported in association with anaemia in pregnancy (Tay & Agboli, 2013). Furthermore, the World Health organization (2014) projection showed that, even though the burden of anaemia among pregnant mothers has declined from 43% to 38% over the past decades, the world Health Assembly (WHA) target of 50% (as compared to 12%), reduction of anaemia by 2025 is far and countries need to focus on achieving this target in near future. Thus, one of the strategies to achieving this target is to enhance pregnant women's knowledge and preventive behaviour towards anaemia through health education. This becomes imperative because, as shown by the Ethiopia Mini Demographic and Health Survey (2014), lack of awareness, poor dietary practice and inappropriate dietary counselling of pregnant mothers are major contributors to high burden of anaemia.

The prevention of anaemia could be by eating balanced meals and iron-rich foods. However, the knowledge of pregnant women plays an important role in the prevention of anaemia particularly by adopting healthy nutritional practices. If anaemia preventive measures remain unknown by pregnant women, their likelihood of becoming anaemic increases substantially. Cheung (2017) noted that, knowledge is the fact or condition of being aware of something or knowing something with familiarity gained through experience or association. In the context of this study, it entails pregnant women's awareness or ability to recall anaemia preventive strategies. O'Brien and Davies (2007) showed that, nutrition knowledge was predictive of change in dietary habits, which prevents anaemia. It is a well-known fact that healthy nutrition cannot be excluded in any effort to prevent anaemia thus, for a pregnant woman not to be anaemic, it is necessary that she gets acquainted with related dietary behaviour and one of such tool to enhance the knowledge of anaemia prevention or healthy nutrition is health education. Nimbalkar et al. (2017) stated that, adequate maternal knowledge is necessary to ensure good health and positive pregnancy outcomes. One helpful strategy to enhance maternal knowledge about the prevention of anaemia is through health education.

Anaemia during pregnancy is a significant public health problem despite that it has preventable causes such as under-nutrition and micronutrient deficiencies which contribute to the high rate of maternal and infant morbidity and mortality reported in developing countries including Nigeria. Despite its preventability, its prevalence is evidence among pregnant women. Therefore, it becomes very essential that the knowledge and preventive behaviour of the pregnant women towards anaemia be assessed with an intervention such as health education to ascertain its effects on both the knowledge and preventive behaviour. Hence, this study investigated gestational age and religion as correlates of effects of health education on the level of knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State.

Research Questions

The study provided answers to the following research questions:

1. What is the effect of health education on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on gestational age?
2. What is the effect of health education on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on religion?

Hypotheses

The following hypotheses postulated were tested at 0.05 level of significance:

1. Health education has no significant effect on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on gestational age.
2. Health education has no significant effect on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on religion.

Theoretical Framework

The theoretical framework for this study was anchored on the Integrated Theory of Health Behaviour Change (ITHBC). The major constructs of ITHBC are knowledge and beliefs, self-regulation, and social facilitation which are related to each other and to the proximal and distal outcomes. The ITHBC is based on the assumption that health behaviour change can be enhanced by fostering knowledge and beliefs, increasing self-regulation skills and abilities, and enhancing social facilitation (which in the present study is the health education intervention used to foster the knowledge of the pregnant women on anaemia and its prevention). Engagement in self-management behaviours is seen as the proximal outcome, and this, in turn, influences the long-term outcome of improved health status. Person-centered interventions are directed to increasing knowledge and beliefs, self-regulation skills and abilities, and social facilitation. According to this theory, persons will be more likely to engage in the recommended health behaviours if they have information about and embrace health beliefs consistent with behaviour, if they develop self-regulation abilities to change their health behaviours, and if they experience social facilitation that positively influences and supports them to engage in preventative health behaviours.

This theory is considered appropriate for this study because, acquiring knowledge about anaemia and adopting anaemia preventive behaviour requires pregnant women to be exposed to an intervention such as health education to get them acquainted with health information to increase their knowledge of anaemia and enhance their behaviour towards anaemia prevention. This is because, this theory purports that, persons will be more likely to engage in the recommended health behaviours if they have information about and embrace health beliefs consistent with behaviour, if they develop self-regulation abilities to change their health behaviours, and if they experience social facilitation that positively influences and supports them to engage in preventative health behaviours. Thus, the health education intervention is aimed at providing the pregnant women with the needed information and to enhance their self-regulation abilities to change their behaviour. Hence, this model was considered appropriate for this study on the effect of health education on the knowledge and preventive behaviour towards anaemia among pregnant women.

Methodology

The research design adopted in this study was a pre-test and post-test research design. The pre-test and post-test research design is described as a research design that involves making observations before and after some intervention not under the researcher's control, participants allotted into the study and control groups are without randomization (Inyang, 2013). This design was used in this study because the research involved two groups of persons, one group which is not exposed to any intervention known as the control group and another group which is exposed to health education intervention known as the experimental group; after which the level of knowledge of the two groups were compared to ascertain the effects of the health education intervention on the two dependent variables. This design was successfully used in other related studies. It was used in a study on the impact of educational intervention regarding anaemia and its preventive measures among pregnant women by Nimbalkar et al. (2017); also in a study on effect of integrated pictorial handbook education on improving anaemia status, knowledge, food intake, and iron tablet

compliance among anemic pregnant women in Indonesia. The successful application of the design by these authors in their respective studies therefore suggested possible success in its use for the present study. Thus, this design was considered appropriate for this study on gestational age and religion as correlates of effects of health education on the level of knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State.

The population for the study consisted of all the pregnant women in Rivers East senatorial district. The population of pregnant women was 133,545 in Rivers East Senatorial District (National Population Commission, 2014). The sample size 600 (300 for the control group and 300 for the intervention group) was obtained through the multi-stage sampling procedure.

The instrument for data collection was a structured questionnaire. Data were analyzed using descriptive statistics of mean and standard deviation (SD) as well as eta square statistics to answer research questions. The guideline proposed by Cohen as cited in Pallant (2011), was used as a criterion for interpreting the value of effect size for health education intervention, where 0 .01 to 0 .05 was considered as small effect size, 0.06 to 0.13 as moderate effect size and 0.14 and above was considered as large effect size. This was used to answer research questions 3 to 8. Also, the intervention was said to have an effect if the post-test mean score was greater than the pre-test mean score. The analysis of covariance (ANCOVA) was used to test the null hypotheses 1 - 8. All the hypotheses were tested at 95% confidence level and at 0.05 level of significance. A hypothesis with p-value less than 0.05 was said to be significant and the null hypothesis rejected and vis visa.

Results

Research question 1: What is the effect of health education on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on gestational age?

Table 1: Mean and standard deviation on the effect of health education on the knowledge of anaemia prevention among pregnant women based on gestational age

<i>Gestational age</i>	<i>Intervention</i>		<i>Control</i>		<i>Eta-value</i>	<i>Decision</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
1-3 months	1.85	.40	1.81	.22	0.06	
4-6 months	1.91	.30	1.65	.31		
7-9 months	1.91	.10	1.61	.37		
Total	1.90	.30	1.72	.30		

Table 1 showed the mean and standard deviation on effect of health education on the knowledge of anaemia prevention among pregnant women based on gestational age. The result of the study showed that respondents in the intervention group with gestational age of 4-6 months and 7-9 months had mean knowledge score of 1.91 ± 0.30 and 1.91 ± 0.10 respectively, while respondents in the control group with gestational age of 1-3 months and 4-6 months had a mean knowledge score of 1.81 ± 0.22 and 1.65 ± 0.31 respectively. The eta square statistics of 0.06 indicating a small effect of health education on knowledge of anaemia prevention based on gestational age.

Research question 2: What is the effect of health education on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on religion?

Table 2: Mean and standard deviation on the effect of health education on the knowledge of anaemia prevention among pregnant women based on religion.

<i>Religion</i>	<i>Intervention</i>		<i>Control</i>		<i>Eta-value</i>	<i>Decision</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Christianity	1.91	.28	1.81	.25	0.010	No effect
Islam	1.36	.00	1.68	.32		
Tradition	0.00	0.00	1.65	.33		
Total	1.90	.10	1.61	.37		

Table 2 showed the mean and standard deviation on effect of health education on the knowledge of anaemia prevention among pregnant women based on religion. The result of the study showed that respondents in the intervention group who were Christians and Islam had mean knowledge score of 1.91 ± 0.40 and 1.36 ± 0.30 respectively, while respondents in the control group who were Christians and Muslims had a mean knowledge score of 1.81 ± 0.22 and 1.68 ± 0.32 respectively. The eta square statistics of 0.010 indicating a small effect of health education on knowledge of anaemia prevention based on religion.

Hypotheses

The following hypotheses postulated were tested at 0.05 level of significance:

1. Health education has no significant effect on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on gestational age.

Table 3: Analysis of Covariance (ANCOVA) on effect of health education on knowledge of anaemia prevention among pregnant women based on gestational age

<i>Source</i>	<i>Type III Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F</i>	<i>p-value</i>	<i>Partial eta square</i>
Corrected Model	.148 ^a	15	.030	.304	.909	.018
Intercept	7.395	3	7.395	76.26	.000	.479
Gestational age	.029	6	.015	.151	.860	.004
Pretest knowledge	.006	3	.006	.059	.809	.001
g/age*pretest know.	.047	6	.024	.244	.784	.006
Error	8.049	249	.097			
Total	329.044	267				
Corrected Total	8.196	264				

a. R Squared = .018 (Adjusted R Squared = -.041)

Table 3 showed the Analysis of Covariate (ANCOVA) which was conducted to ascertain the effect of health education on knowledge of anaemia prevention based on gestational age. The result of the ANCOVA showed that the intervention had no significant effect [$F(3,264) = 0.244$, $p > 0.05$] on the knowledge of anaemia prevention based on gestational age. Only 0.6% ($\omega^2 = 0.006$) of the variance in the post-test knowledge scores could be explained by the gestational age of the respondents. Therefore, the null hypothesis which stated that, health education has no significant effect on knowledge of anaemia prevention based on gestational age was not rejected.

Ho2: Health education has no significant effect on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on religion.

Table 4 Analysis of Covariance (ANCOVA) on effect of health education on knowledge of anaemia prevention among pregnant women based on religion

Source	Type III Sum of Squares	Df	Mean Square	F	p- value	Partial eta square
Corrected Model	.295 ^a	6	.148	1.747	.180	.036
Intercept	11.713	3	11.713	138.6	.000	.596
Religion	.000	0	.000	.000	.000	.000
Pretest knowledge	.001	3	.001	.012	.913	.000
religion*pretest know.	.000	0	.000	.000	.000	.001
Error	7.943	282	.084			
Total	359.606	291				
Corrected Total	8.238	288				

a. R Squared = .036 (Adjusted R Squared = .015)

Table 4 showed the Analysis of Covariate (ANCOVA) which was conducted to ascertain the effect of health education on knowledge of anaemia prevention based on religion. The result of the ANCOVA showed that the intervention had a significant effect [$F(3, 288) = 0.000$, $p < 0.05$] on the knowledge of anaemia prevention based on religion. Therefore, the null hypothesis which stated that, health education has no significant effect on knowledge of anaemia prevention based on religion was not rejected.

Discussion of Findings

The result in table 4.4 showed a small and non-significant effect of health education on knowledge of anaemia prevention based on gestational age [$F = 0.244$, $p > 0.05$; eta square = 0.06]. This finding could be explained by the fact that the intervention, which is health education, did not take any special consideration on the age of the respondents as it was administered the same way across all the age groups whereas, there was possibly a role their age played in their ability to grasp information. The finding of this study is in keeping with that of Kamau et al. (2019) whose study in Kenya found a significant effect of the health education intervention on the knowledge of anaemia prevention such as iron and folic acid supplementation among pregnant women but no statistically significant difference in the characteristics of the pregnant women including their age. This similarity found between the two studies could also be explained by the fact that they have similar study population which were pregnant women and research design.

The findings of the study in table 4.5 showed a small and significant effect of health education on knowledge of anaemia prevention based on religion [$F = 0.000$, $p < 0.05$; eta square = 0.010]. This finding is not surprising because the religion of an individual a very strong force driving and influencing their knowledge, choices and behaviour as they tend to listen and pay attention to any information that is not in contradiction to their religious belief thus, the significance found in this study based on the religion of the respondents. To buttress this, the prevention of anaemia is basically concern with what the pregnant women consume, that is, their nutritional practices which is mostly influenced by the religious belief of individuals as they tend to feed on

what their religion permits and forbid any food not permitted by their religion. The finding of this study is not in keeping with that of Kamau et al. (2019) whose study in Kenya found a significant effect of the health education intervention on the knowledge of anaemia prevention such as iron and folic acid supplementation among pregnant women but no statistically significant difference in the characteristics of the pregnant women which may include their religion. This divergence found between the two studies could be explained by the fact that though two studies were conducted among pregnant women, their study population varies in their socio-demographic characteristics.

Conclusion

Based on the findings of the study, it was concluded that health education has a significant effect both on the knowledge of anaemia and preventive behaviour towards anaemia among pregnant women in Rivers East senatorial district.

Recommendations

Based on the findings of the study, the following recommendations were put forward:

1. The medical officers in each of the antenatal clinics should maintain the knowledge and preventive behaviour by making a schedule for health education on anaemia prevention from time to time, to keep on increasing the knowledge of these women on anaemia prevention in pregnancy.
2. Maternal health care professionals including gynaecologist and obstetricians should give more attention to anaemia prevention among the pregnant women during their antenatal visit by making information relating to it available to them.
3. Health care workers should incorporate the religious leaders to encourage anaemia preventive behaviour particularly as it concerns what to eat and what not to eat, to benefit the pregnant women.
4. Health educators should also play their role by emphasizing on anaemia preventive behaviour as a subject of discussion in the class as the children which they teach may in turn carry the message to their parents to influence their behaviour.
5. Religious leaders should help to encourage proper nutrition by talking about the subject from time to time in their denominations, still to increase the knowledge of this pregnant women on anaemia prevention.
6. Husbands should give more attention to the nutrition of their pregnant wives by giving them more money during pregnancy to purchase whatever they needed to eat to prevent anaemia and to promote the health of both the mother and the baby in utero.
7. Family members of the pregnant women should also be supportive to the pregnant women by assisting them to prepare the necessary foods needed to prevent anaemia among the pregnant women.

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EFFECTS OF HEALTH EDUCATION ON LEVEL OF KNOWLEDGE AND PREVENTIVE BEHAVIOUR TOWARDS ANAEMIA AMONG PREGNANT WOMEN IN RIVERS EAST SENATORIAL DISTRICT RIVERS STATE

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Abstract

This study investigated the effect of health education on the level of knowledge and preventive behaviour towards anaemia among pregnant women in Rivers East senatorial district of Rivers State. Four research questions were answered and two hypotheses were tested at 0.05 level of significance. The pre-test and post-test research design was adopted with a population which consisted of 133,545 women of childbearing age in Rivers East senatorial district. A multi-stage sampling procedure was adopted to select a sample size of 600 hundred respondents for the study. Data was collected using a structured questionnaire and analysis was carried out using SPSS version 25.0. The findings of the study showed a significant effect of health education on knowledge of [F= 0.000, $p < 0.05$; eta square = 0.06] and preventive behaviour [F= 0.000, $p < 0.05$; eta square = 0.20] towards anaemia among pregnant women. The effect of the intervention on knowledge was found to be significant based on educational level [F = 0.257, $p < 0.05$]. The study concluded that, health education has a significant effect both on the knowledge of anemia and preventive behaviour towards anaemia among pregnant women in Obio/Akpor. It was recommended among others that the medical officers in each of the antenatal clinics should maintain knowledge and preventive behaviour by making a schedule for health education on anaemia prevention from time to time, to keep on increasing the knowledge of these women on anaemia prevention in pregnancy.

Keywords: effects, health education, knowledge, preventive behaviour, anaemia

Introduction

Health education is an important strategy used to influence health related knowledge and one of the ways of promoting behaviour change by creating awareness about existing or potential health problems including anaemia. Health education is the use of information to persuade patients or individuals to protect, promote health and prevent health problems. In the context of this study, it is referred to as the use of information to influence knowledge and persuade pregnant women to adopt anaemia preventive behaviour. The study of Nahrishah et al. (2019) showed that health education intervention significantly improved the knowledge of anaemia and preventive behaviour such as daily iron intake from food. In the same vein, O'Brien and Davies (2007) showed that, sensitization improved pregnant women's quality of food intake; which can prevent anaemia. The foregoing could be buttressed with the fact that, health education is an enlightenment tool that can be used to enhance women's knowledge about any health related issue and influence their health behaviour change. However, even been aware or knowledgeable about a particular health behaviour including anaemia prevention which majorly involves healthy nutrition, iron intake from food or other sources, if one does not have the financial capability, the practice may not be in commensurate with the knowledge.

Socioeconomic status is an enabling factor that gives motion to any intended health behaviour including anaemia prevention. As stated earlier, since anaemia prevention is largely dependent on healthy nutrition either through natural foods or supplementation, the influence of socioeconomic status of the woman cannot be over-emphasized. This is even evident in the high prevalence of anaemia in the low socioeconomic class as reported by studies (Meda et al., 2011; Nwizu et al., 2011) which was as a result of financial constraints and inability to afford quality education to enhance their knowledge, nutritious diet and good maternal health services. Mohammed and Emmanuel (2013) reported that, pregnant women from the low socioeconomic class were four times more anaemic than those from high socioeconomic class which is also indicative of the low level of anaemia prevention among low socioeconomic class due to poor economic power. On the other hand, socioeconomic status can determine the educational status of women.

Educational status is well known for its influence on women's health preventive behaviour and knowledge about vast maternal health issues. Education has a way of influencing the decision of an individual including anaemia prevention. It gives an individual more likelihood of being enlightened and to adopt good health practices. Olatubosun et al. (2014) stated that, women with no formal education had poor health seeking behaviour to prevent anaemia and a poor understanding of balanced diet. Mulambalah et al. (2014) noted that low educational status is associated with strong adherence to cultural taboos that often led to selection of food types by pregnant women culminating in nutritional deficiency such as Iron and Vitamin B12 deficiency, which are some of the major nutrients need to be taken in order to prevent anaemia among pregnant women. Thus, educational status can influence both the knowledge and preventive behaviour towards anaemia among pregnant women. On the other hand, even among the highly education individuals, their religion can have a stronger influence on their anaemia preventive behaviour because of the discrepancies in nutritional choices of the different religions in Nigeria.

In Nigeria, the prevalence of anaemia was reported by Nwizu et al. (2011) to be 64.7% specifically for those in the low socioeconomic class. Anaemia has been said to be responsible for 16% of maternal deaths in India, 11% in Kenya, 9% in Nigeria and 8% in Malawi. Estimates of maternal mortality from anaemia range from 34 per 100,000 live births in Nigeria to as high as 194 per 100,000 live births in Pakistan. In combination with obstetric hemorrhage, anaemia is estimated to be responsible for 17% to 46% of cases of maternal deaths. Increased risks of premature labor and low birth weight have been reported in association with anaemia in pregnancy (Tay & Agboli, 2013). Furthermore, the World Health Organization (2014) projection showed that, even though the burden of anaemia among pregnant mothers has declined from 43% to 38% over the past decades, the world Health Assembly (WHA) target of 50% (as compared to 12%), reduction of anaemia by 2025 is far and countries need to focus on achieving this target in near future. Thus, one of the strategies to achieving this target is to enhance pregnant women's knowledge and preventive behaviour towards anaemia through health education. This becomes imperative because lack of awareness, poor dietary practice and inappropriate dietary counselling of pregnant mothers are major contributors to high burden of anaemia. Thus, this study focused on the effect of health education on knowledge and preventive behaviour towards anaemia among pregnant women attending antenatal clinics in Rivers East Senatorial District of Rivers State.

Research Questions

The study provided answers to the following research questions:

1. What is the effect of health education on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State?
2. What is the effect of health education on preventive behaviour towards anaemia among pregnant women in Rivers East Senatorial District of Rivers State?
3. What is the effect of health education on preventive behaviour towards anaemia among

pregnant women in Rivers East Senatorial District of Rivers State based on socioeconomic status?

4. What is the effect of health education on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on level of education?

Hypotheses

The following hypotheses postulated were tested at 0.05 level of significance:

1. Health education has no significant effect on the preventive behaviour towards anaemia among pregnant women in Rivers East Senatorial District of Rivers State based on socioeconomic status.
2. Health education has no significant effect on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on level of education.

Theoretical Framework

This work adopted the theory of Precaution Adoption Process Model (PAPM) which was developed by Weinstein, Sandman and Blalock in the year 1992. The precaution adoption process model (PAPM) is model that is most useful in describing how a person comes to a new decision, and how that person can take the decision and make it become an action. The concepts of the model were first discussed in 1988 with a formal accepted formulation of the model coming in 1992. Adoption of a new precaution or cessation of a risky behaviour requires deliberate steps unlikely to occur outside of conscious awareness. The Precaution Adoption Process Model (PAPM) attempts to explain how a person comes to decisions to take action and how he or she translates that decision into action. Adoption of a new precaution or cessation of a risky behaviour requires deliberate steps unlikely to occur outside of conscious awareness. The PAPM applies mainly to actions, rather than the gradual development of habitual patterns of behaviour, and would apply to the initiation of a new diet.

The PAPM was based on the assumption that there are qualitative differences among people, and question whether changes in health behaviours can be described by a single prediction equation. The PAPM describes a set of categories (stages) defined in terms of psychological processes within individuals. All PAPM stages prior to action are defined in terms of mental states, rather than in terms of factors external to the person, such as current or past behaviours. Neither are PAPM stages defined in terms of criteria that are salient only to health professionals. PAPM stages refer to behaviours that are salient to laypeople, such as how often they eat red meat, rather than to criteria salient mainly to professionals, such as percentage of fat in a person's diet.

The model is a seven-stage sequence that describes in entirety, being unaware to taking action, which is different from standard models where people are either acting or not acting; this model investigates behaviour change as dynamic and changes occurring over time. The PAPM described behaviour in stages but works along with other models, because it in itself does not provide a specific set of variables that differentiate between stages, nor does it provide a way for progression to occur from stage to stage. The in-between point of the stages is moved forward along the PAPM by the individual's own health beliefs, such as perceived susceptibility, severity, barriers, benefits, and self-efficacy.

The constructs in PAPM describes a set of categories (stages), defined in terms of psychological processes within individuals. Seven stages were identified along the path from lack of awareness to action (shown in Fig 1). At some initial point in time, people are unaware of the health issue (Stage 1). When they first learn something about the issue, they are no longer unaware, but they are not yet engaged by it either (Stage 2). People who reach the decision-making stage

(Stage 3) have become engaged by the issue and are considering their response. This decision-making process can result in one of three outcomes: They may suspend judgment, remaining in Stage 3 for the moment. They may decide to take no action, moving to Stage 4 and halting the precaution adoption process, at least for the time being. Or, they may decide to adopt the precaution, moving to Stage 5. For those who decide to adopt the precaution, the next step is to initiate the behaviour (Stage 6). A seventh stage, if relevant, indicates that the behaviour has been maintained over time (Stage 7). Although not shown in Fig 1 below, movement backward toward an earlier stage can also occur, without necessarily going back through all the intermediate stages, although obviously it is not possible to go from later stages to Stage 1. The constructs which are given in stages are shown in the diagram below:

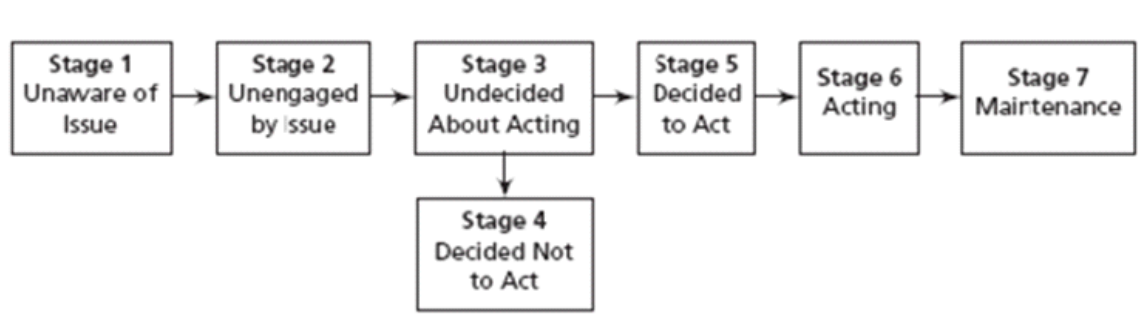


Fig 1: Precaution Adoption Process Model

Fig 1 above shows the key Constructs of the Precaution Adoption Process Model which identifies seven stages along the path from lack of awareness to action.

These stages start with a person being entirely unaware of some issues (prevention measures for anaemia in pregnancy). Hence, the need for the health education intervention to sensitize and create awareness about the prevention of anaemia during pregnancy. If at some point, probably the first day of the intervention, the pregnant woman becomes in any capacity aware of the anaemia preventive behaviour but still do not entertain the ideas as an issue, she have entered stage 2. Once the person has engaged the awareness gotten, and entered decision making, the person has hit Stage 3. From Stage 3, the person can end the PAPM and end at Stage 4 which is decision never to adopt such behaviour, however, as the intervention continues, the person can re-entered the decision-making process again, if after the decision making process, the person decides to accept the behaviour due to the level of knowledge acquired from the intervention, then that person will enter Stage 5 (i.e. decision to act) to decide or accept the initiation of anaemia preventive behaviour. After acceptance of the behaviour, the person will then begin a new behaviour which will put the person in Stage 6. Once the person has accepted the behaviour and continue to maintain that behaviour over time, the person will be in maintenance Stage 7. Thus, adopting this model entails that the study intends to influence both the knowledge of anaemia and preventive behaviour towards anaemia among the pregnant women through process which is the health education intervention to, move the pregnant women from the stage of unawareness to the stage of adopting the behaviour and maintaining it throughout the pregnancy, in order to have an expected pregnancy outcome.

Methodology

The research design adopted in this study was a pre-test and post-test research design. The pre-test and post-test research design is described as a research design that involves making observations before and after some intervention not under the researcher's control, participants allotted into the

study and control groups are without randomization. This design was used in this study because the research involved two groups of persons, one group which is not exposed to any intervention known as the control group and another group which is exposed to health education intervention known as the experimental group; after which the level of knowledge of the two groups were compared to ascertain the effects of the health education intervention on the two dependent variables. This design was successfully used in other related studies. It was used in a study on the impact of educational intervention regarding anaemia and its preventive measures among pregnant women by Nimbalkar et al. (2017); also in a study on effect of integrated pictorial handbook education on improving anaemia status, knowledge, food intake, and iron tablet compliance among anemic pregnant women in Indonesia. The successful application of the design by these authors in their respective studies therefore suggested possible success in its use for the present study. Thus, this design was considered appropriate for this study on gestational age and religion as correlates of effects of health education on the level of knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State.

The population for the study consisted of all the pregnant women in Rivers East senatorial district. The population of pregnant women was 133,545 in Rivers East Senatorial District (National Population Commission, 2014). The sample size 600 (300 for the control group and 300 for the intervention group) was obtained through the multi-stage sampling procedure.

The instrument for data collection was a structured questionnaire. Data were analyzed using descriptive statistics of mean and standard deviation (SD) as well as eta square statistics to answer research questions. The guideline proposed by Cohen as cited in Pallant (2011), was used as a criterion for interpreting the value of effect size for health education intervention, where 0.01 to 0.05 was considered as small effect size, 0.06 to 0.13 as moderate effect size and 0.14 and above was considered as large effect size. This was used to answer research questions 3 to 8. Also, the intervention was said to have an effect if the post-test mean score was greater than the pre-test mean score. The analysis of covariance (ANCOVA) was used to test the null hypotheses 1 - 8. All the hypotheses were tested at 95% confidence level and at 0.05 level of significance. A hypothesis with p-value less than 0.05 was said to be significant and the null hypothesis rejected and vis visa.

Results

Research question 1: What is the effect of health education on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State?

Table 1: Mean and standard deviation on effect of health education on knowledge of anaemia prevention among pregnant women attending antenatal clinics

Group		N	Mean	S.D.	Mean difference	Decision
Intervention	Pre-test	300	1.65	.30	0.26	Moderate effect
	Post-test	300	1.91	.28		
Control	Pre-test	294	1.70	.29	0.05	
	Post-test	294	1.75	.50		

Table 1 showed the mean and standard deviation on effect of health education on knowledge of anaemia prevention among pregnant women attending antenatal clinics. The result showed that, respondents in the intervention group had a mean score of 1.91 ± 0.28 at the post-test with a mean difference of 0.26 while respondents in the control group had a mean knowledge score of 1.75 ± 0.50 at the post-test with a mean difference of 0.05. The result showed that health education had an effect on knowledge of anaemia prevention among pregnant women.

Research question 2: What is the effect of health education on preventive behaviour towards anaemia among pregnant women in Rivers East Senatorial District of Rivers State?

Table 2: Mean and standard deviation on effect of health education on preventive behaviour towards anaemia among pregnant women attending antenatal clinics.

Group		N	Mean	S.D.	Mean difference	Decision
Intervention	Pre-test	300	3.14	.89	0.66	Large effect
	Post-test	300	3.80	.34		
Control	Pre-test	294	2.00	.00		
	Post-test	294	2.01	.01		

Table 2 showed the mean and standard deviation on effect of health education on the preventive behaviour towards anaemia among pregnant women attending antenatal clinics. The result showed that, respondents in the intervention group had a mean score of 3.80 ± 0.34 at the post test with a mean difference of 0.66 while respondents in the control group had a mean score of 2.00 ± 0.00 with a mean difference of 0.01 at the post test. The result indicated that health education had an effect on preventive behaviour towards anaemia among pregnant women.

Research question 3: What is the effect of health education on preventive behaviour towards anaemia among pregnant women in Rivers East Senatorial District of Rivers State based on socioeconomic status?

Table 3: Mean and standard deviation on the effect of health education on preventive behaviour towards anaemia among pregnant women based on socio-economic status

<i>Socio-economic status</i>	<i>Intervention</i>		<i>Control</i>		<i>Eta-value</i>	<i>Decision</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Low	3.70	.45	3.15	.71	0.026	
Average	3.81	.31	3.27	.70		
High	3.87	.22	2.82	1.14		
Total	3.81	.31	3.17	.80		

Table 3 showed the mean and standard deviation on effect of health education on the preventive behaviour towards anaemia among pregnant women based on socio-economic status. The result of the study showed that respondents in the intervention group with high and average socio-economic status had mean score of 3.87 ± 0.22 and 3.81 ± 0.31 respectively, while respondents in the control

group with average and low socio-economic status had a mean score of 3.27 ± 0.70 and 3.15 ± 0.71 respectively. The eta square statistics of 0.026 indicating a small effect of health education on preventive behaviour towards anaemia based on socio-economic status.

Research question 4: What is the effect of health education on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on level of education?

Table 4: Mean and standard deviation on the effect of health education on the knowledge of anaemia prevention among pregnant women based on level of education

<i>Education</i>	<i>Intervention</i>		<i>Control</i>		<i>Eta-value</i>	<i>Decision</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
None	1.67	.31	1.50	.36	0.09	Small effect
Primary	1.95	.04	1.67	.32		
Secondary	1.88	.37	1.62	.32		
Tertiary	1.94	.06	1.88	.13		
Total	1.90	.29	1.74	.29		

Table 4 showed the mean and standard deviation on effect of health education on the knowledge of anaemia prevention among pregnant women based on level of education. The result of the study showed that respondents in the intervention group with primary education had mean knowledge score of 1.67 ± 0.31 , tertiary education had a mean knowledge score of 1.94 ± 0.06 , while respondents in the control group with primary education had a mean knowledge score of 1.67 ± 0.32 , tertiary education had a mean knowledge score of 1.88 ± 0.13 . The eta square statistics was calculated to ascertain the effect of the intervention on the group. The eta square statistics of 0.04 indicating a small effect of health education on knowledge of anaemia prevention based on educational level.

Hypothesis 1: Health education has no significant effect on the preventive behaviour towards anaemia among pregnant women in Rivers East Senatorial District of Rivers State based on socioeconomic status

Table 5: Analysis of Covariance (ANCOVA) on effect of health education on the preventive behaviour towards anaemia among pregnant women based on socio-economic status

<i>Source</i>	<i>Type III Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F</i>	<i>p-value</i>	<i>Partial eta square</i>
Corrected Model	.465 ^a	15	.093	.922	.471	.049
Intercept	21.395	3	21.395	212.	.000	.702
Socioeconomic	.216	6	.108	1.07	.347	.023
Pretest behaviour	.094	3	.094	.932	.337	.010
economic*pretest beh	.235	6	.118	1.166	.316	.025
Error	9.072	270	.101			
Total	1410.00	288				
Corrected Total	9.537	285				

a. R Squared = .049 (Adjusted R Squared = -.004)

Table 5 showed the Analysis of Covariate (ANCOVA) which was conducted to ascertain the effect of health education on preventive behaviour towards anaemia based on socio-economic status. The result of the ANCOVA showed that the intervention had no significant effect [$F(3, 285) = 1.166$, $p > 0.05$] on the preventive behaviour towards based on socio-economic status. However, 2.5% ($\omega^2 = 0.05$) of the variance in the post intervention behaviour could be explained by the socio-economic status of the respondents. Therefore, the null hypothesis which stated that, health education has no significant effect on knowledge of anaemia prevention based on socio-economic was not rejected.

Hypothesis 2: Health education has no significant effect on the knowledge of anaemia prevention among pregnant women in Rivers East Senatorial District of Rivers State based on level of education

Table 6: Analysis of Covariance (ANCOVA) on effect of health education on knowledge of anaemia prevention among pregnant women based on level of education.

Source	Type III Sum of Squares	Df	Mean Square	F	p-value	Partial eta square
Corrected Model	.322 ^a	21	.046	.517	.039	.820
Intercept	.445	3	.445	4.99	.053	.028
Education	.065	9	.022	.245	.008	.865
Pretest knowledge	.040	3	.040	.447	.005	.506
education*pretest know	.069	9	.023	.257	.009	.086
Error	7.925	267	.089			
Total	360.016	291				
Corrected Total	8.247	288				

a. R Squared = .039 (Adjusted R Squared = -.037)

Table 6 showed the Analysis of Covariate (ANCOVA) which was conducted to ascertain the effect of health education on knowledge of anaemia prevention based on level of education. The result of the ANCOVA showed that the intervention had a significant effect [$F(27,288) = 0.257$, $p < 0.05$] on the knowledge of anaemia prevention based on level of education. However, only 8.6% ($\omega^2 = 0.086$) of the variance in the post-test knowledge scores could be explained by the level of education of the respondents. Therefore, the null hypothesis which stated that, health education has no significant effect on knowledge of anaemia prevention based on level of education was rejected.

Discussion of Findings

The finding in Table 5 showed a small and non-significant effect of health education on preventive behaviour towards anaemia based on socio-economic status [$F = 1.166$, $p > 0.05$; eta square statistics = 0.026]. This finding could be explained by the fact that though money is needed to procure the necessary food and supplement needed for a better nutritional practice to prevent anaemia, they are not so expensive thus, could be reached by the pregnant women, thus would have been implicated for the statistically non-significant effect found based on the socio-economic status of the respondents. The finding of this study is in keeping with that of Kamau et al. (2019) whose study in Kenya found a significant effect of the health education intervention on anaemia prevention such as iron and folic acid supplementation among pregnant women but no statistically significant

difference in the socio-demographic characteristics of the pregnant women including their socio-economic status. This similarity found between the two studies could also be explained by the fact that they have similar study population which were pregnant women and research design.

The result in Table 6 showed a small and significant effect of health education on knowledge of anaemia prevention based on educational level [$F = 0.257$, $p < 0.05$; eta square = 0.04]. This finding may not be surprising also because education has a way of helping someone comprehend information quickly thus, significance found. The finding of this study is not in consonance with that of Kamau et al. (2019) whose study in Kenya found a significant effect of the health education intervention on the knowledge of anaemia prevention such as iron and folic acid supplementation among pregnant women but no statistically significant difference in the characteristics of the pregnant women including their educational level. This divergence found between the two studies could be explained by the fact that though two studies were conducted among pregnant women, their study population varies in their socio-demographic characteristics.

Conclusion

Based on the findings of the study, it was concluded that health education has a significant effect both on the knowledge of anaemia and preventive behaviour towards anaemia among pregnant women in Rivers East senatorial district.

5.3 Recommendations

Based on the findings of the study, the following recommendations were put forward:

1. The medical officers in each of the antenatal clinics should maintain knowledge and preventive behaviour by making a schedule for health education on anaemia prevention from time to time, to keep on increasing the knowledge of these women on anaemia prevention in pregnancy.
2. Maternal health care professionals including gynaecologist and obstetricians should give more attention to anaemia prevention among pregnant women during their antenatal visit by making information relating to it available to them.
3. Health educators should also play their role by emphasizing on anaemia preventive behaviour as a subject of discussion in the class as the children which they teach may in turn carry the message to their parents to influence their behaviour.
4. Husbands should give more attention to the nutrition of their pregnant wives by giving them more money during pregnancy to purchase whatever they need to eat to prevent anaemia and to promote the health of both the mother and the baby.
5. Family members of the pregnant women should also be supportive to the pregnant women by assisting them to prepare the necessary foods needed to prevent anaemia among the pregnant women.

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HYGIENE CONDITIONS OF FOOD AND WATER COMPANIES

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Abstract

This paper examined the hygiene conditions of food and water production companies. The study adopted the systematic review research design. Relevant articles were randomly drawn from high rated search websites. Only papers which met conditions for inclusion were selected for review. Analysis was done qualitatively using findings from the selected articles. Results showed that adherence to standard food hygiene practices and water sanitation was poor in developing countries. Findings also showed that good hygiene and water sanitation practices can protect communities from food-borne illness and waterborne diseases. Consequently, the study recommended that food and water company authorities should establish good communication with its personnel in the factory for continual instructions and monitoring; the management of food and water company should also embark on strategic education and regular training for the staff in order to keep pace with new technology in the food processing and water supply industry; and personnel of food and water company to engage in food control by communicating with their host community to educate people about food hygiene.

Keywords: food, hygiene, water, company

Introduction

Issues of poor hygiene for food and water are among critical public health concerns. Unsafe food has been a public health problem from early recorded history with many food safety problems encountered today not being new. This brought to the fore the need for food and water safety, more so, from the company sources. The food system has significant impacts on a wide range of other social and political issues including sustainability, biological diversity, economics, population growth, water supply and access to food.

Authorities world over have been trying maximally to improve the safety of food and water supplied; the occurrence of both food-borne and water-borne diseases remain significant health issues in both developed and developing countries. The increasing public health problem in emergent and developed nations from food-borne illnesses giving rise to some diseases or morbidity condition leading to mortality in the general population, especially among susceptible groups, such as infants, young children, elderly and the immune-compromised cannot be over-emphasized (Nyenje & Ndip, 2013).

It had been estimated that 70% of diarrheal episodes are linked with the ingestion of contaminated foods in developing countries adding that food borne diseases account for 40% disease burden among under-5 years (WHO, 2018). In a similar vein, World Health Organization,

WHO (2017) estimated that approximately 600 million people fall ill after eating contaminated food resulting in 33 million healthy years' loss. About 2 million people die every year due to diarrheal diseases, most of them are children less than 5 years of age (WHO, 2004). According to World Health Organization (WHO) (2014), an estimated 1.5 billion cases and over 125, 000 deaths occur in children every year as a result of water and food contaminations. In 2004, the UK charity WaterAid reported that a child dies every 15 seconds from easily preventable water-related diseases most likely from poor/lack of sewage disposal. More than 2.2 million people died in 2000 from waterborne diseases (related to the consumption of contaminated water) or drought. The most affected are the populations in developing countries, living in extreme conditions of poverty, normally peri-urban dwellers or rural inhabitants. World Health Organization (2015) had noted that 663 million people are still without access to clean drinking; 8 out of 10 people without access to clean water live in rural areas; 159 million people use untreated water from lakes and rivers; at least 1.8 billion people use a drinking-water source contaminated with faeces and contaminated drinking water is estimated to cause 502,000 diarrhoeal deaths each year.

Providing access to sufficient quantities of safe water, the provision of facilities for a sanitary disposal of excreta, and introducing sound hygiene behaviours are of capital importance to reduce the burden of disease caused by these risk factors (*IWMI, 2013*). Access to improved water and sanitation facilities does not, on its own, necessarily lead to improved health and hygiene. Evidence shows that hygienic behaviour is crucial to protecting against illness and disease (Akabande et al. 2017). Of these behaviours, hand washing with soap at key moments (including after defecation, before food preparation and eating) is of utmost importance. Therefore, food-borne illness is a public health problem causing morbidity and mortality in general population. Food safety remains a critical issue with outbreaks of food borne illness resulting in substantial costs to individuals, the food industry and the economy. Food safety is a basic need but there is a danger that it may be overlooked in the development of effective and efficient processes.

Hygiene has been defined as the set or series of practices performed to preserve (or associated with the preservation of) health. The word, 'hygiene' is derived from "Hygeia", which was the goddess of preventive health according to Greek mythology. According to the World Health Organization (WHO), "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases" (WHO, 2020). Although many people equate hygiene with 'cleanliness' and frequently used them interchangeably "hygiene" generally refers to practices that prevent spread of disease-causing organisms just as emphasized by Nigerian Centre for Disease Control (NCDC) and WHO in the cases of control for COVID-19 and Ebola (Elechi & Offiah, 2021). Hygiene is a practice related to lifestyle, cleanliness, health and medicine. In public health, the word is used in the terms like *occupational hygiene, mental hygiene, dental hygiene, body hygiene, and sleep hygiene*. In the manufacturing of food, pharmaceutical, cosmetic and other products, good hygiene is a critical component of quality assurance. In developing countries, universal access to water and sanitation, coupled with hygiene promotion is essential in reducing infectious diseases. This approach has been integrated into the Sustainable Development Goal Number 6 whose second target states: "By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations" (UNDP, 2017). Due to their close linkages, water, sanitation, hygiene are together abbreviated and funded under the term WASH in development cooperation.

Food is any substance consisting essentially of carbohydrate, fat, protein, mineral, vitamin, water, choline, fibre and most likely other nutrients used in the body of an organism to sustain growth and vital processes and to furnish energy. Alternatively, food is any nutritious substance that people or animals eat or drink or that plants absorb (as nutriment) for nourishment in order to maintain life and growth. (Fisher & Rogers, 2021) Omnivorous humans are highly adaptable and have adapted to

obtain food in many different ecosystems. Items not included in the legal definition of food include animal feed, live animals (unless being prepared for sale in a market), plants prior to harvesting, medicinal products, cosmetics, tobacco and tobacco products, narcotic or psychotropic substances, and residues and contaminants. (United Kingdom Office of Public Sector Information, 2021) **Water** with chemical formula H_2O , a **molecule** and covalent bonds of one oxygen and two hydrogen atoms, is an inorganic, transparent, tasteless, odourless, and nearly colourless chemical substance, which is the main constituent of Earth's hydrosphere and the fluids (acting as a solvent) of all known living organisms. Water as a versatile or universal solvent, is essential to living organisms.

Concepts of food hygiene and safety practices

A vital aspect of health preservation for good quality of life is '**food hygiene**', which points to the many practices needed to safeguard the quality of food from production to consumption. This is sometimes referred to as 'from farm to fork/table', because it includes every stage in the process from growing on the farm, through storage and distribution, to finally eating the food. It also includes the collection and disposal of food wastes. Throughout this chain of events there are many points where, directly or indirectly, knowingly or unknowingly, unwanted chemicals and microorganisms may contaminate the food. "**Food safety**" is a closely related but broader concept that means food is free from all possible contaminants and hazards. In practice both terms may be used interchangeably (The Open University, 2021). Codex Alimentarius defines food hygiene as "all conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain," and food safety as "assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use" (Professional Evaluation and Certification Board, PECB, 2021).

Food is said to be hygienic when it is free of a hazardous substance that could be harmful to human or animal health (Ababio & Adi, 2012). Though this is the case, microbiological hazards in ready to eat food and chemical hazards, mostly pesticides from agricultural products including fresh vegetables and fruits have been highlighted by earlier investigators. Recent reports also highlighted the danger of high levels of heavy metals including lead, cadmium, arsenic, mercury and copper from utensils, raw materials or transport methods used (Foriwa & Lovatt, 2015). Ensuring food hygiene and safety practice among vendors is one challenge that has existed for decades, and therefore the need for vendors to adhere to high standard food safety regulations and hygiene practices cannot be overemphasized. However, a preventive strategy based on thorough analysis of prevailing conditions to ensure the achievement of quality assurance programme objectives is also recommended. According to WHO (2014), it is estimated that more than 200,000 people die of food poisoning annually in Nigeria from food borne pathogens (especially *E. coli* and *Salmonella*). The deaths were caused by contaminated foods through improper processing, preservation and service. Practices acknowledged as contributing to food borne outbreaks include improper refrigeration, prolonged handling and inadequate reheating of cooked food and contamination of food by commercial or household food handlers who worked while ill or had poor personal hygiene (Pepple, 2017). The knowledge of food handlers about the food borne infections and their safety practices is an important issue in the outbreaks of food borne infection (Mukhopadhyay et al., 2012). The implementation of good hygienic practices (GHP) is required to control the food quality and to ensure that the customers are not exposed to any food-related risks. These practices consist of a set of procedures aimed to attain specific identity and quality standards of products and/or services in the food industry, including materials and utensils these products may get in contact with.

Good hygiene practices have been documented to prevent several food-borne diseases when

practiced. It is broadly acclaimed that deliberate or accidental contamination of food due to inappropriate handling of food might endanger the lives of consumers (Annor & Baiden, 2011). Several hygiene practices such as poor personal and environmental hygiene, inadequate storage of food and drinks, improper preparation and cooking are known to compromise the safety of food. Hygiene in a variety of settings plays an important role in preventing the spread of infectious diseases by breaking the chain of infection transmission (Bloomfield et al., 2009). It includes procedures used for food and water hygiene, hand hygiene, hygiene of environmental sites and surfaces, home health care (the care of those who are at greater risk of infection) etc. In response to the need for effective codes of hygiene in home and everyday life settings the International Scientific Forum on Home Hygiene (*IFH*) has developed a risk-based approach based on Hazard Analysis Critical Control Point (HACCP), also referred to as "targeted hygiene." Targeted hygiene is based on identifying the routes of pathogen spread in the home and introducing hygiene practices at critical times to break the chain of infection (IFH, 2012). The overall purpose of food hygiene is to prepare and provide safe food and consequently contribute to a healthy and productive society. The specific objectives for food hygiene are to:

- Prevent **food spoilage**, i.e. changes that make food unfit for consumption due to microbial or chemical contamination.
- Inform and educate people about simple and practical methods of keeping food safe to protect themselves against foodborne diseases.
- Protect food from adulteration (intentional contamination).
- Ensure proper practice in the food trade to prevent the sale of food that is offensive or defective in value and quality (The Open University, 2021)

Communities need be advised about the correct methods of food handling and preparation to ensure that food is safe to eat. The key principles for safe food preparation are outlined below.

- Choose foods that are not easily damaged by transportation, accidents or by storage.
- Cook foods thoroughly, especially meat because this can help to kill any microorganisms that might be present in the food.
- Eat cooked foods immediately after they are cooked, rather than leave them out and eat later. Delays in eating cooked food can lead to the growth and reproduction of microorganisms in the cooked foodstuff.
- Store cooked food carefully at an appropriate temperature. It should either be kept cold, ideally in a refrigerator, or it should be kept hot.
- If food must be reheated, be sure to reheat it thoroughly.
- Avoid contact between raw and cooked food.
- Wash hands properly before handling food and before eating.
- Keep all kitchen surfaces and utensils meticulously clean.
- Protect food from animals including insects, rodents and other animals.
- Use safe water in food preparation and for washing fruits and vegetables to be eaten raw (The Open University, 2021).

Four key aspects of the several important principles for any food control system are the integrated farm-to-table concept, preventive approaches, risk analysis and transparency. (The Open University, 2021)

It was in 2001 that the International Organization for Standardization (ISO) commenced work on an auditable standard for Food Safety Management System (FSMS). This international FSMS standard, known as ISO 22000, was published in September 2005. It is a framework that pools prerequisite programmes, the HACCP principles and application steps as described by the Codex Alimentarius Commission and elements of the ISO 9001:2000 standard. Within two years

more than 50 countries started using the standard as an alternative to more than 20 food safety schemes developed by individual companies in the sector for auditing their suppliers. ISO 22000 intends to define the FSMS requirements that companies are required to meet in order to conform to food safety regulations worldwide. ISO 22000:2018 FSMS is a necessity for any organization in the food chain, and it lays down what is required of a system of food safety management. It defines organizational needs which establish its ability to control food safety hazards and ensure the safety of food for human consumption. It takes a food chain approach to food safety. It states the established requirements for management of food safety that apply to all organizations in the food supply chain including food producers and manufacturers. It stipulates the needs for an FSMS to combine the following strategic elements to ensure safety of food along the food chain:

1. Interactive communication. Communication along the food chain is important to identify and adequately control all relevant food safety hazards at each stage of the food chain. This entails intra-organizational communication, both upstream and downstream along the food chain.
2. Management system. ISO 22000 can be applied independently of other management system standards. Its application can be allied or incorporated with current interrelated management system necessities, while organizations may use prevailing system(s) of management to inaugurate a system of food safety management that fulfils the requirements of ISO 22000.
3. Hazard Analysis and Critical Control Point (HACCP) principles and prerequisite programmes. ISO 22000 incorporates the principles of the HACCP system, and through auditable requirements it combines the plan of HACCP with prerequisite programmes (PRPs). Prerequisite programmes encompass all basic conditions and activities that are required to sustain an environment that is hygienic all through the food chain which is suitable for the production, handling and provision of safe end products.

Hazard Analysis and Critical Control Point (HACCP) is an industry-specific hazard assessment tool that is centred on preventing hazards instead of inspecting end-products (Psomas & Kafetzopoulos, 2015). The HACCP tool can be applied throughout the food chain from primary production to final consumption. This is different from the HACCP system which is a universally recognized Food Safety System. The HACCP system aids in identifying and controlling the hazards that may arise in the process of producing food. The system canters around the prevention of potential hazards by strictly monitoring and controlling each critical control point of the food production process. Although the HACCP system was made up of three principles initially, it has been revised over time to simplify it and introduce changes; however, the initial concept of HACCP has always been maintained. The three original HACCP principles were: 1) Identification and assessment of hazards associated with the food product; 2) Determination of the critical control points to control the identified hazards; and 3) Establishment of a system to monitor the critical control points.

Water safety management system concept

Safety of potable water source of supply is also paramount, calling for need to maintain utmost hygiene. Water that is fit for human consumption is called potable water (safe drinking water or improved drinking water) and had been described as water that is of sufficient quality to be used for drinking and for ensuring hygiene status without causing risk to health. Source of potable water must be free of contamination but always accessible. Drinking water should come from an approved source, whether that means it is piped and running or it is provided in containers. Drinking water should be pleasant in taste and be odour-free to encourage drinking. Water is essential to sustain life, and a satisfactory (adequate, safe and accessible) supply must be available to all. Improving access to safe drinking-water can result in tangible benefits to health. Every effort should be made to achieve a drinking-water quality as safe as practicable.

The three main threats to drinking water, are microbial (Dysentery, Cholera, Typhoid Fever, *Escherichia coli*; Hepatitis E, Hepatitis A, Polio; *Cryptosporidium*, *Giardia*, *Toxoplasma gondii*), chemical, and radiological (WHO, 2014; Savelli, 2019). On this note it is worth recalling that germs are spread from person to person through contaminated hands in the absence of good hygiene. Human excreta contain germs that can cause disease. Hands that have been in contact with excreta, nasal excretions and other bodily fluids, can pass large numbers of germs. In addition to germs, hands can be a transport route for dangerous materials, like pesticides or other toxic chemicals. Hand washing is especially important at workplaces, where large numbers of people may congregate in close quarters. Water that is not potable may be made potable by filtration or distillation, desalination or by a range of other methods (European Investment Bank, 2020).

Water is a strategic resource in the globe and an important element in many political conflicts. However, some observers have estimated that by 2025 more than half of the world population will be facing water-based vulnerability. A report, issued in November 2009, suggests that by 2030, in some developing regions of the world, water demand will exceed supply by 50%. Similarly, the quantity of water available to everyone is predicted to decrease by 30% with 40% of the world's inhabitants having insufficient fresh water for minimal hygiene. (UNDP, 2010)

Public health laws regulating food and water company

With keen interest on the public healthcare and improved quality of life, many countries world over have their own legislations and rules to regulate food processing establishments. These food laws provide the basis for National Food Control Systems which is the regulation of the food supply industry and enforcement of food laws by national or local authorities. For continued operation, the food and water companies observe principles of food control systems and become knowledgeable of their scope, component and structure.

As an integral part of the 'Nigerian National Health Policy', the Government of Nigeria launched the "National Policy on Food Hygiene and Safety" in 2000 to re-emphasize existing legislations for coordination and implementation. The overall goal of the National Policy on Food Safety is to establish a national institutional framework that will consolidate all existing food safety and control systems in the country and ensure the attainment of a high level of food safety standards (Omojokun, 2013). Such legislations include:

1. Public Health Laws (1917) now known as Public Health Ordinance Cap 165 of 1958;
2. The Standards Organization of Nigeria Decree No. 56 of 1971;
3. The Food and Drug Act No 35 of 1974 (now Food and Drug Act Cap F32 Laws of the Federal Republic of Nigeria, 2004)
4. The Animal Disease Control Decree No. 10 of 1988;
5. The Marketing of Breast Milk Substitute Decree No. 41 of 1990 (now Marketing (Breast Milk) Act Cap M5 LFN 2004;
6. The National Agency for Food and Drugs Administration and Control Decree No 15 of 1993 (now NAFDAC Act CAPN1 Laws of the Federal Republic of Nigeria, 2004);
7. The Food, Drug and Related Products (Registration etc.) Decree No 19 of 1993 [now Food, Drugs & Related Products (Registration etc.) Act Cap F33 Laws of the Federal Republic of Nigeria (LFN), 2004];
8. The Counterfeit and Fake Drugs and Unwholesome Processed Food Act No 25 of 1999 (now Counterfeit & Fake Drugs and Unwholesome Processed Foods (Miscellaneous Provisions) Act Cap C34 LFN 2004;
9. Various bye-laws enacted by various LGAs in the country. (Omojokun, 2013)

Responsibility for food control is shared between different agencies and ministries including Federal Ministry of Health, Federal Ministry of Agriculture, National Agency for Food

and Drugs Administration and Control (NAFDAC), Standards Organisation of Nigeria (SON), National Codex Committee as well as States and Local Governments.

Other nations/countries' legislations on this issue abound. Australian legislation on food safety requirements has exemplary statutes in the New South Wales (NSW) State/Territory of Australia Food Act 2003 (NSW) and the Food Regulation 2015 (NSW). The NSW Food Authority is responsible for regulating and monitoring food safety across the entire NSW food industry with functions as food business licensing, conducting food business inspections, managing food labeling requirements etc. (Feitshans & Curtis, 2013). Vaish Associate Advocates (2013) stated India Legislations governing the food industry was the Prevention of Food Adulteration (PFA) Act, 1954 with 8 laws now repealed but recently changed to the Food Safety and Standards Act, 2006 (hereinafter referred to as "FSSA"). Canadian Federal Food Safety Legislations include Canada Agricultural Products Act, Fish/Meat Inspection Act & Regulations, Food and Drug Act & Regulations as well as Consumer packaging and labelling Act (Allwood & Warriner, 2004). Environmental Public Health (Food Hygiene) Regulations of South-Eastern Asia Small Island Developing States, focused on food quality control/food safety, fraud/deceit/adulteration, hygiene/sanitary procedures, inspection, fish/meat/poultry products, fruits/edible nuts, toxicity/poisoning, vending, water conservation zone, water quality standards etc (Feitshans & Curtis, 2013; FAO, 2014).

Dealing with hygiene of food and water in company/workplace

Food safety is a basic need but there is a danger that it may be overlooked in the development of effective and efficient processes. It is a fundamental requirement of any food process that the food produced should be safe for consumption. Many people die of food poisoning annually in Nigeria from food borne pathogens from contaminated food and water consumption in emergent nations. Workers in any company/workplace have a right to a safe and healthy workplace. With this right, comes the responsibility of taking the appropriate personal actions to maintain company hygiene, like hand washing and reporting hygiene risks. Workers' representatives and workers' organizations together with the workers can use the checkpoints to enhance company hygiene, reduce worker illness and promote morale, welfare, and productivity at the company or workplace.

Food contamination is common not only in developing countries but also in developed countries of the world. This is particularly high when food is prepared for a large number of people in a company or workplace at the same time, especially in canteens and restaurants. Food can become contaminated at any point during slaughtering or harvesting, processing, storage, distribution, transportation and preparation (Akintaro, 2012). Eating out of the home may lead to an increased risk of contracting a food borne illness. According to Arendt et al. (2013), eating away from home, especially in restaurants is associated with a significant number of food-borne disease outbreaks in the United States. The usual micro-organisms involved in food industry and contracted by food handlers are *Salmonella*, *E. coli* O157, *Staphylococcus aureus*, Enteric viruses (Norwalk, rotavirus), and Hepatitis A as well as *Listeria monocytogenes* which are endemic in drains, cold stores, and difficult to clean areas.

The altering patterns of food consumption have had a great influence on the increasing incidence of food-borne diseases. Food vendors play important role in ensuring food safety throughout the chain of food production and storage (Akabande, 2017). Food contamination can occur at any point during its preparation, bringing to bear the importance of food safety and hygiene in the prevention of food-borne diseases (Ismail & Abdullahi, 2013). Hygienic cleaning can be done through --- Mechanical removal, using a process or product that inactivates the pathogens in situ, and in some cases, use of combined pathogen removal with kill. Food and water company often engages on elaborate cleaning with the following steps (Allwood & Warriner, 2004): 1) Dry-clean,

2) Pre- rinse, 3) Apply detergent, 4) Post-rinse, and 5) Sanitize. They use different types of detergents - general purpose (GP), alkaline, chlorinated (chlorinated alkaline), acid, and enzyme. Such companies also employ some detergent application methods - soak tanks, foam, automated systems (clean- in- place & parts washers), and manual (pails). Concentrations of cleaning disinfectants and where applied also vary with lower concentrations for food contact surfaces.

Conclusion

Food as any nutritious substance eaten to maintain vital life processes is important for human beings and affects human physiological activity, growth, repair and energy, and psychological and social relations. All over the world people are seriously affected every day by diseases that are caused by consuming unhygienic and unsafe food which thus contract them contaminants such as microorganisms and chemicals. Food hygiene and safety issues are not separate from human health concerns or from community health issues. Good food hygiene practices can protect the community from food-borne illness and can be used to prevent and control **food-borne diseases**. Foodborne diseases result from eating foods that contain infectious or toxic substances.

In both, industrial and domestic food preparation, maintaining good personal hygiene while handling food is very important to prevent food-borne illness. Not necessarily only ill personnel can pose threat to food safety, everyone involved in preparation of food can be a source of contamination. Thus, food handlers should perceive the highest possible standards of personal hygiene to make sure that food does not become contaminated by food safety hazards. Food laws and regulations are so-designed to ensure a high level of protection against food contamination.

Recommendations

Considering the continuous fight to break the chain of infective process targeting the food and water company activities, the following recommendations have been stated by the reviewer of this work.

1. **The food and water company authority need to establish good communication with its personnel in the factory for continual instruction and monitoring.**
2. **Strategic education and regular training should be embarked upon by the management of food and water company for the staff in order to keep pace with new technology in the food processing and water supply industry.**
3. Personnel of **food and water company** has principal role in food control by communicating with their host community to educate people about food hygiene and food safety.
4. The national agencies (e.g. NAFDAC) that have responsibility for inspection of food and drink service establishments to ensure no slack in their operational guideline for compliance.
5. The countries' ministries, departments and agencies (MDAs), e.g. ministries of health and agriculture, SON, need be aware of the potential difficulties with the food control system (farm-to-table continuum) and streamline their roles and responsibilities to avoid possible duplication of regulatory activity, fragmented surveillance and lack of coordination.
6. The agencies like NAFDAC and SON should ensure their supervisory role of inspection be strict at all stages of the food production and distribution chain, rather than only inspection and rejection at the final stage to make better economic sense.
7. Governments should recognise the continuous application of a HACCP approach by the food industry as a fundamental tool for improving the safety of food.
8. The authorities of these nations should endeavour to provide credit facility for owners of the

food industry as funding concerns likely obviate utmost hygiene for food safety.

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BURDENS AND MANAGEMENT STRIDES OF COVID-19 PANDEMIC
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Abstract

This research reviewed the burdens and management strides of COVID-19 pandemic. A meta-analysis method is undertaken in the retrospective study design using basically secondary data. Several relevant articles were randomly selected from highly-rated research database platforms. Only those which met the inclusion criteria were considered for this systematic review. Articles with similar findings were grouped together for analysis. Findings revealed that the enormous effects of COVID-19 burden on management strides were overwhelmed healthcare institutions and systems during peak infection, global economic recession, social disruption, increase in crime rate or insecurity and increase in domestic violence, disorganized educational system, worsened hunger state and agriculture, disruption of culture and religious activities, political disarray, increased xenophobia and racism, and many prolonged health complications. The study also identified fast manufacture of vaccines, narrowing to specific treatment drugs with appropriate dieting. It was recommended that individuals should be encouraged to find healthy supportive ways to cope with stress, such as meditation, journaling, and speaking with a counselor, and practice of good sleep hygiene. There is need to track trends in stress levels and their drivers along with building resilient organization in order to help health care organizations monitor the impact COVID-19 has on their workforce during this pandemic with workload redistribution. Lastly, more vigorous single-dose vaccination against the pandemic with monetary incentive was also considered as a possible option for increased vaccination acceptance in developing countries.

Keywords: COVID-19 pandemic, disease-burden, management strides

INTRODUCTION

The World appeared to have been taken by surprise on consideration of the novel Coronavirus outbreak and rate of spread. The World Health Organization (WHO), in late (specifically 31) December 2019, received reports of an outbreak on clusters of severe respiratory diseases including pneumonia cases of unknown causes in Wuhan City, Hubei Province of China where it was first identified. The Chinese authorities subsequently identified a novel strain of Coronavirus (Severe Acute Respiratory Syndrome Coronavirus 2, SARS-CoV-2) as the causative agent. The Chinese scientists rapidly isolated a SARS-CoV-2 from a patient within a short time on 7 January 2020 and came out to genome sequencing of the SARS-CoV-2. (Wang et al, 2020; WHO, 2020a & b) The pandemic has resulted in travel restrictions and nationwide lockdown in many countries (Ugbodaya, 2020). The COVID-19 pandemic has led to a dramatic loss of human life worldwide and presents an unprecedented challenge to public health, food systems and the world of work. The economic and social disruption caused by the pandemic is devastating: tens of millions of people are at risk of

falling into extreme poverty, while the number of undernourished people, currently estimated at nearly 690 million, could increase by up to 132 million by the end of the year (WHO, 2020c). On 18th march 2020, the world health organization issued a report related to mental health and psychological issues by addressing instructions and social considerations during the COVID-19 outbreak.

Due to doubts if pets or other livestock may pass on coronavirus to humans many people were reluctant to keep their pets fearing transmission, for instance in the Arab world, celebrities were urging people to keep and protect their pets. With the global coronavirus pandemic in its second year and vaccine safety concerns easing, governments are still struggling to vaccinate their populations to approach herd immunity levels. New variants are emerging as many locales plan to reopen schools, domestic and international travel is increasing, and people relax their vigilance around physical distancing, mask wearing, and other public health interventions. The African region has a relatively lower burden of the disease using the proportion of cases and case fatality rate (CFR) when compared to other regions. Likewise, the CFR seen in Nigeria is lower than the global rate. The health burden caused by the pandemic has the potential to disrupt and further weaken already fragile health systems including Nigeria.

Mode of transmission is basically air-borne and through fomites. These symptoms appear within 2-14 days after exposure to the virus, although the average incubation period is 5 days. Symptoms and signs have been classified as mild symptoms - fever, dry cough and tiredness; moderate symptoms - aches and pains including headache, sore throat, conjunctivitis, loss of taste or smell and a rash on skin, or discolouration of fingers or toes; and severe symptoms - difficulty breathing or shortness of breath, chest pain or pressure and loss of speech or movement. Polymerase chain reaction (PCR) for Covid-19 as the diagnostic molecular test is been ultimately done. Considering the unintended effect of the pandemic in the disruption of health services for other diseases, these services must be considered in the preparedness and response plans for the pandemic to prevent eroding previous gains in other disease programmes. (Akande, 2020) Consequent upon the above COVID-19 pandemic impact on humanity and the efforts made to check its spread with attendant effect, this work reviewed the burden of COVID-19 pandemic, strides made on intervention strategies and the legal basis of some actions taken. Meta-analysis method has used in the present study through review of scholarly works gotten from internet, journals and books.

COVID-19 effects worldwide

COVID-19 is a virus that has created tension and devastation around the globe. The most obvious consequences include economic recession, a crisis of global governance, trade protectionism and increasing isolationist sentiment. People-to-people, cultural and travel exchanges have all been restricted. Nonetheless, this is just a tip of the iceberg. (Akanni & Gabriel, 2020; Anumihe, 2021) The effects of COVID-19 have been quite enormous and herein outlined thus:

- 1) Overwhelmed healthcare institutions and systems worldwide due to global health emergency and worsened poor health, e.g. increase in an infection rate, increase in death or mortality rate, increase in drug abuse and drug misuse, psychological issues like mental ill-health/psychosis
- 2) Global economic depression/recession with deteriorated financial set-back (financial crises), e.g. inflation on goods and services, increase in unemployment rate (due to reduction in demand for goods and services), and increase in entrepreneurs
- 3) Social disruption, e.g. increase in crime rate or insecurity, increase in domestic violence
- 4) Disorganized educational system, e.g. poor operational system of education with reduced academic performance
- 5) Worsened hunger state leading to increase malnutrition resulting from total restriction of

movement (nationwide lockdown) and border closures due to widespread nature of the infection

- 6) Effects on culture and disruption of religious activities
- 7) Implications on politics
- 8) Effects on agriculture
- 9) Environment and climate effects
- 10) Xenophobia and racism implications
- 11) Information dissemination implications
- 12) Possible long-term adverse effects
- 13) Others: Inequality in corona-virus state. Low income individuals are more likely to contract the coronavirus and to die from it; increased use of online educational instruction; and intensive efforts to provide alternative services through digital platforms.

1. Global overwhelmed health care systems and institutions

The pandemic has had many impacts on global health beyond those caused by the COVID-19 disease itself. It has led to a reduction in hospital visits for other reasons. Due to the pandemic, people were afraid to visit the health facilities for fear of contacting the virus. This reduced the number of people visiting the facilities and subsequently affected the health of the people. There have been 38 per cent fewer hospital visits for heart attack symptoms in the United States and 40 per cent fewer in Spain. The head of cardiology at the University of Arizona said, "My worry is some of these people are dying at home because they're too scared to go to the hospital". There is also concern that people with strokes and appendicitis are not seeking timely treatment. Again on suicide, the coronavirus pandemic has been followed by a concern for a potential spike in suicide, exacerbated by social isolation due to quarantine and social distancing guidelines, fear of unemployment and financial factors.

The virus is also taking its toll on health facilities and infrastructures across the globe. Italy is currently the largest affected country with a number of deaths surpassing China, since the outbreak of coronavirus. Across northern Italy, the virus has pushed the country's National Health Service to a breaking point, emphasizing the test that other countries, especially developing and low-income countries, might face in their approach to contain the virus spread. Most hospitals and health facilities that could not handle the hazards are resulting to operating below their capacity by taking a few regular health-related cases or shutting down.

2. Global economic recession with deteriorated financial crises/increased national poverty

2.1 Increased national poverty. What could be more devastating is the fact that the economic pains that accompanied the virus might not go away soon as envisaged. There was substantial increase in the national poverty rate of 8.7% points due to COVID-19, and households lost almost a quarter of their incomes on average during the lockdown period. During this time, 17 million more people fell into poverty in Nigeria - a country that already accounted for the highest absolute number of poor people in Sub-Saharan Africa before the COVID-19 crisis. Many households lost their jobs, means of livelihood as a result of the pandemic.

2.2 Difficulty revamping macroeconomic depression. The conventional policy measures currently being taken such as reducing interest rates and costs of borrowing, tax cuts and tax holidays are quite remarkable. However, these conventional policy measures are quite potent when there are demand shocks. There are limitations to the successes that can be recorded when demand shocks are combined with supply shocks. It is already apparent from the emergence of the current crisis that there are implications on the economy from both the demand and supply sides. Some of the demand

factors include social distancing with consumers staying at home, limitations in spending and declining consumptions. On the supply side, factories are shutting down or cutting down production and output, while in other instances, staff work from home to limit physical contact.

Before the pandemic, the Nigerian government had been grappling with weak recovery from the 2014 oil price shock, with GDP growth tapering around 2.3 percent in 2019. In February, the IMF revised the 2020 GDP growth rate from 2.5 percent to 2 percent, as a result of relatively low oil prices and limited fiscal space. Relatedly, the country's debt profile has been a source of concern for policymakers and development practitioners as the most recent estimate puts the debt service-to-revenue ratio at 60 percent, which is likely to worsen amid the steep decline in revenue associated with falling oil prices. These constraining factors will aggravate the economic impact of the COVID-19 outbreak and make it more difficult for the government to weather the crisis (Lateef & Samuel, 2020).

2.3 Surplus fossil fuel with negative cost: Considering oil and other energy markets, in early February 2020, Organization of the Petroleum Exporting Countries (OPEC) "scrambled" after a steep decline in oil prices due to lower demand from China. On Monday, 20 April, the price of West Texas Intermediate (WTI) went negative and fell to a record low (minus \$37.63 per barrel) due to traders' offloading holdings so as not to take delivery and incur storage costs. June prices were down but in the positive range, with a barrel of West Texas trading above \$20.

2.4 Dearth of raw material: The virus created a shortage of precursors (raw material) used in the manufacturing of fentanyl and methamphetamine. The Yuancheng Group, headquartered in Wuhan, is one of the leading suppliers. Price increases and shortages in these illegal drugs have been noticed on the street of the UK. U.S. law enforcement also told the New York Post Mexican drug cartels were having difficulty in obtaining precursors.

2.5 Increase in entrepreneurs: The effect of the lockdown with resultant loss of job, led some persons to go into entrepreneurship as they found a need in their environment and met those need in a bid to survive and make ends meet.

3. Social disruption

3.1 Increase in unemployment: The pandemic has decimated jobs and placed millions of livelihoods at risk. As breadwinners lose jobs, fall ill and die, the food security and nutrition of millions of women and men are under threat, with those in low-income countries, particularly the most marginalized populations, which include small-scale farmers and indigenous peoples, being hardest hit.

3.2 Increase in domestic violence: There is a surge in the normal of violence associated with the lockdown as spouses who lived in different locations had to live together, the constant close contact led to violence against their spouse. Many countries have reported an increase in domestic violence and intimate partner violence attributed to lockdown amidst the COVID-19 pandemic. Financial insecurity, stress, and uncertainty have led to increased aggression at home, with abuser able to control large amounts of their victims' daily life.

3.3 Increase in crime rate: The pandemic coupled with the lock down resulted in massive loss of job which has left people jobless and as such some engaged in various crimes such as arm robbery, theft and so many vices in the society. Current data suggests that the impact of COVID-19 on crime,

security and the rule of law is going to be significant and long-lasting (Lateef & Samuel, 2020).

3.4 Increase in population size: There is a resultant increase in population size following the lockdown as families were made to stay at home and thus number of women that got pregnant increased.

4. Disorganized educational system

The COVID-19 pandemic has severely affected educational systems worldwide, leading to the near-total closures of schools, colleges and universities. Most government around the world decided to temporarily close educational institutions in an attempt to reduce the spread of COVID-19 with many switching to ONLINE EDUCATION. According to data released by UNESCO on 25th March, 2020, schools and universities closure due to COVID-19 were implemented national wide in 165 countries, including localized closures. This affected over 1.5 billion students worldwide, accounting for 87% of enrolled learners. As of September 30, 2020, approximately 1.077 million learners are currently affected due to school closures in response to the pandemic. According to UNICEF Monitoring Unit, 53 countries are currently implementing local closures, impacting about 61.6% of the world's students' population; 72 countries school are currently open. On 23 March, 2020, Cambridge International Exam (CIE) released a statement announcing the cancellation of Cambridge/GCSE, a Cambridge O' level Cambridge international AS and A level Cambridge AICE Diploma and Cambridge Pre-U examinations for the May/June 2020 series across all countries.

The educational system and even the lives of the scholars and children from disadvantaged families had been negatively impacted, causing interrupted learning as those who cannot be connected via online learning were left behind. School closure impact not only students, teachers, and families, but have reached economic and societal consequences. School closure in response to pandemic have shed light on various social and economic issues including students debt, digital learning, food insecurity, homelessness as well as access to childcare, healthcare, housing, internet and disability services. This impact was more severe for disadvantaged children and their families, compromise nutrition, childcare problems and consequence economic cost to families who could not work.

5. Worsened hunger state with increased malnutrition

The pandemic has disrupted global food supplies and threatens to trigger a new food crisis. David Beasley, head of the World Food Programme (WFP), said "we could be facing multiple famines of biblical proportions within a short few months." Senior officials at the United Nations estimated in April 2020 that an additional 130 million people could starve, for a total of 265 million by the end of 2020.

6. Effects on culture and disruption of religious activities

The performing arts and cultural heritage sectors have been profoundly affected by the pandemic. Arts and culture sector organisations attempted to uphold their (often publicly funded) mission to provide access to cultural heritage to the community, maintain the safety of their employees and the public, and support artists where possible. By March 2020, across the world and to varying degrees, museums, libraries, performance venues, and other cultural institutions had been indefinitely closed with their exhibitions, events and performances cancelled or postponed. In response there were intensive efforts to provide alternative services through digital platforms.

6.1 Effects on musicians and theatre arts

The performing arts also have been greatly affected by the pandemic, impacting organisations' operations as well as individuals - both employed and independent - globally. There was only permitted dependence on digital platforms. The entertainment industry has also been affected, with many music groups suspending or cancelling concert tours. The Eurovision Song Contest, which was due to be held in Rotterdam, the Netherlands in May, was cancelled; however, the Netherlands was retained as host for 2021. Many large theatres such as those on Broadway also suspended all performances. Some artists have explored ways to continue to produce and share work over the internet as an alternative to traditional live performance, such as live streaming concerts or creating web-based "festivals" for artists to perform, distribute, and publicise their work. Online, numerous COVID-19-themed Internet memes have spread as many turn to humour and distraction amid the uncertainty.

6.2 Effects on religious activities

The pandemic has impacted religion in various ways, including cancellation of the worship services of various faiths, the closure of Sunday schools, as well as the cancellation of pilgrimages surrounding observances and festivals. Many churches, synagogues, mosques, and temples have offered worship through live stream amidst the pandemic. Holy Week observances in Rome, which occur during the last week of the Christian penitential season of Lent, were cancelled. Many dioceses have recommended older Christians stay home rather than attend Mass on Sundays; services have been made available via radio, online live streaming and television, though some congregations have made provisions for drive-in worship. With the Roman Catholic Diocese of Rome closing its churches and chapels and St. Peter's Square emptied of Christian pilgrims, other religious bodies also cancelled in-person services and limited public gatherings in churches, mosques, synagogues, temples and gurdwaras. Iran's Health Ministry announced the cancellation of Friday prayers in areas affected by the outbreak and shrines were later closed, while Saudi Arabia banned the entry of foreign pilgrims as well as its residents to holy sites in Mecca and Medina. The 2020 Hajj was limited to around 1,000 selected pilgrims, in contrast to the usual number of over 2 million.

6.3 Effects on sports

The pandemic has caused the most significant disruption to the worldwide sporting calendar since the Second World War. Most major sporting events have been cancelled or postponed, including the 2019–20 UEFA Champions League, 2019 – 20 Premier League, UEFA Euro 2020, 2019 – 20 NBA season, and 2019 – 20 NHL season. The outbreak disrupted plans for the 2020 Summer Olympics in Tokyo, Japan, which were originally scheduled to start at 24 July 2020, and were postponed by the International Olympic Committee to 23 July 2021.

7. Implications on politics

7.1 Overview

The pandemic has affected the political systems of multiple countries, causing suspensions of legislative activities, isolations or deaths of multiple politicians, and rescheduling of elections due to fears of spreading the virus. Starting in late May, large-scale protests against police brutality in at least 200 U.S. cities and later worldwide in response to the killing of George Floyd raised concerns of a resurgence of the virus. Although they have broad support among epidemiologists, social distancing measures have been politically controversial in many countries. Intellectual opposition to social distancing has come primarily from writers of other fields, although there are a few heterodox epidemiologists.

7.2 UNO & NATO

On 23 March 2020, United Nations Secretary-General António Manuel de Oliveira Guterres issued an appeal for a global ceasefire in response to the pandemic; 172 UN Member States and Observers signed a non-binding statement in support of the appeal in June, and the UN Security Council passed a resolution supporting it in July. The planned NATO "Defender 2020" military exercise in Germany, Poland, and the Baltic states, the largest NATO war exercise since the end of the Cold War, will be held on a reduced scale. The Campaign for Nuclear Disarmament's general secretary Kate Hudson criticised the exercise, saying "it jeopardises the lives not only of the troops from the U.S. and the many European countries participating but the inhabitants of the countries in which they are operating."

7.3 China

The Chinese government has been criticised by the United States government, UK Minister for the Cabinet Office, Michael Gove, and others for its handling of the pandemic. A number of provincial-level administrators of the Communist Party of China (CPC) were dismissed over their handling of the quarantine measures/ efforts in central China, a sign of discontent with their (the political establishment) response to the outbreak in those regions. Some commentators believed this move was intended to protect Chinese Communist Party general secretary Xi Jinping from the controversy. The U.S. intelligence community says China intentionally under-reported its number of coronavirus cases. The Chinese government maintains it has acted swiftly and transparently.

7.4 Italy

In early March, the Italian government criticised the European Union's lack of solidarity with coronavirus-affected Italy-Maurizio Massari, Italy's ambassador to the EU, said "only China responded bilaterally", not the EU. On 22 March, after a phone call with Italian Prime Minister Giuseppe Conte, Russian president Vladimir Putin had the Russian army sent military medics, disinfection vehicles, and other medical equipment to Italy. President of Lombardy Attilio Fontana and Italian Foreign Minister Luigi Di Maio expressed their gratitude for the aid. Russia also sent a cargo plane with medical aid to the United States. Kremlin spokesman Dmitry Peskov said "when offering assistance to U.S. colleagues, [Putin] assumes that when U.S. manufacturers of medical equipment and materials gain momentum, they will also be able to reciprocate if necessary." In early April, Norway and EU states like Romania and Austria started to offer help by sending medical personnel and disinfectant, and Ursula von der Leyen offered an official apology to the country.

7.5 United States --- The outbreak prompted calls for the United States to adopt social policies common in other wealthy countries, including universal health care, universal child care, paid sick leave, and higher levels of funding for public health. Beginning in mid-April 2020, there were protests in several U.S. states against government-imposed business closures and restricted personal movement and association. Simultaneously, protests ensued by essential workers in the form of a general strike. In early October 2020, Donald Trump and many other government officials were diagnosed with COVID-19, further disrupting the country's politics.

7.6 Other countries

Iran, South Korea, Japan, the Philippines, including Egypt, Turkey, Thailand and Australia political economy were equally affected.

8. Effects on agriculture

The COVID-19 pandemic has disrupted agricultural and food systems worldwide. As the pandemic

progressed and lockdown was issued across the states, the agricultural sector was affected and this went beyond primary agriculture to subsectors such as food processing, food-related trade and transport, and food services. All of these components of the agro-food system have strong linkages to the rest of the economy and, therefore, suffer severe shocks when restrictions are placed on other sectors, such as manufacturing, education and tourism. In the case of COVID-19, most shocks originate from the consumer's "plate" and pass back through to the "farm" where they affected the livelihoods of both small-holder and large-scale farmers (Akanni, 2020).

COVID-19 hit at a time when hunger or undernourishment was once again on the rise in the world, with an estimated 690 million people already going hungry in 2019. Based on the latest UN estimates, the economic recession triggered by the pandemic may lead to another 83 million people, and possibly as many as 132 million, going hungry in 2020. This is mainly due to a lack of access to food – linked to falling incomes, lost remittances and, in some cases, a rise in food prices." It is estimated that without intervention 30 million people may die of hunger, with Oxfam reporting that "12,000 people per day could die from COVID-19 linked hunger" by the end of 2020.

COVID-19 management and its strides

COVID-19 management has been improving though with slightly different approaches based on the countries, e.g. the United States, Russia, China and the United Kingdom have subtle variations in treatment steps. In every country the focus for management of the pandemic is by prevention through vaccine and non-pharmaceutical strategies. Diagnosis through finding the clinical presentation and laboratory investigation is an outstanding aspect of managing COVID-19 pandemic. Treatment has earlier been based on symptomatic treatment with different broad spectrum drugs but now narrowing down to specific drugs like molnupiravir (newest one), remdesivir, azithromycin and zinc. Drugmaker Merck said Friday (1/10/21) that its experimental COVID-19 pill (new drug called molnupiravir) reduced hospitalizations and deaths by half in people recently infected with the coronavirus and that it would soon ask health officials in the U.S. and around the world to authorize its use.

At home, the seemingly healthy person with or without symptoms should stay isolated for a minimum of 10 days; visitors are not allowed near the person, ill person to have adequate nutrition with enough fluid; and ill person to have separate and special dishes, eating utensils, caps and bed linens, washed with soap and water. Enough rest is additionally recommended. Treatment of COVID-19 in the hospital is based on the client's clinical condition but supportive care for infected persons can be highly effective. A conservative or de-resuscitative fluid strategy with early use of vasopressors and inotropes are recommended. The general principles of management include

- use of supplemental oxygen in hospitalized patients
 - non-invasive ventilation and continuous positive airway pressure (ventilators usage)
 - intubation and protective mechanical ventilation
 - conservative use of fluids by drinking lots of fluids
 - Antipyretic analgesics to combat fever and pains are given
 - empiric antibiotics supporting treatment, including chloroquine and hydroxychloroquine (HCQ); azithromycin cap; antivirals such as remdesivir, lopinavir-ritonavir, favipiravir, molnupiravir etc.
 - tabs zinc and vitamin C; and inj interferon by subcut.
 - use of cough syrup, intravenous immunoglobulin, convalescent plasma, and traditional Chinese medicine
 - close monitoring of vital signs with the care-giver properly kitted.
- For prevention and control, prevention protocol has been streamlined (Elechi & Offiah,

2021). Once an epidemic is in the community transmission phase, the combination of isolating infected individuals and quarantining their contacts, workplace distancing and school closure have been found to significantly reduce the number of Covid-19 infections (NPHCDA, 2020). See the streamlined preventive measures:

- Wash hands often and thoroughly with soap and water or use (clean/rub them with) an alcohol-based sanitizer
- Wear a mask to cover your mouth and nose when in a public settings or around others (when physical distancing is not possible)
- Practice social distancing by maintaining at least six feet distance between you and people coughing or sneezing
- Practice physical distancing by avoiding unnecessary travel or when there is no pressing need to go out in order to stay away from large groups of people (not gathering in groups and avoiding crowded places or mass gatherings)
- Stay home if you feel unwell
- Avoid people that are sick
- Avoid touching (do not touch) your face (eyes, nose or mouth)
- Cover your mouth and nose when coughing or sneezing with a tissue paper and dispose tissue properly after use
- Do not cough or sneeze into your hands but to your bent-elbow when tissue is not available
- Seek regular updates
- Refrain from smoking and other activities that weaken the lungs
- Clean and disinfect frequently touched surfaces
- Everyone should keep a healthy lifestyle at home
- Stay active and make social contact with loved ones through the phone or internet, like children need extra love and attention from adults during difficult times
- Keep to regular routines and schedules as much as possible (European Centre for Disease Prevention and Control, ECDC, 2020; NCDC, 2021)

Offering support by psychotherapy with reassurance to allay anxiety is needed. Similarly, health educating the patient on proper disposal of used items is worth a good measure. After vaccination, follow current guidelines to prevent the spread of COVID-19, the CDC warned. This is because "After you are fully vaccinated against COVID-19, you may be able to start doing some things that you had stopped doing because of the pandemic". (Korab, 2021b) The three FDA-approved COVID vaccines that are currently being administered have proven to be largely effective and safe, both in clinical trials and the real world. "COVID-19 vaccines are safe and effective," says the CDC. "Millions of people in the United States have received COVID-19 vaccines under the most intense safety monitoring in U.S. history. CDC (2020) recommends you get a COVID-19 vaccine as soon as you are eligible."

COVID-19 Vaccine which is the utmost prevention strategy has some persons who need not take it and others who should postpone it temporarily (CDC,2020; Martins, 2021; Korab, 2021a). They include (i) persons who recently been vaccinated for flu or shingles, delay the vaccine and Wait at least 14 days after your COVID-19 vaccine before getting any other vaccine, including a flu or shingles vaccine, for data are lacking on the safety and efficacy of COVID-19 vaccines administered simultaneously with other vaccines:

(ii) persons allergic to the vaccine's ingredients; any ingredient in an mRNA COVID-19 vaccine (such as polyethylene glycol e.g. Pfizer-BioNTech or Moderna); An immediate allergic reaction means a reaction within 4 hours of getting vaccinated, or non-severe allergic reaction, including symptoms such as hives, swelling of the face and throat, or wheezing (respiratory distress/difficulty

breathing), a fast heartbeat, a bad rash all over your body, and dizziness and weakness. An allergic reaction is considered severe when a person needs to be treated with epinephrine or EpiPen® or if they must go to the hospital. Your doctor may refer you to a specialist in allergies and immunology to provide more care or advice. (Korab, 2021a) If the rash is itchy, you can take an antihistamine. If it is painful, you can take a pain medication like acetaminophen or a non-steroidal anti-inflammatory drug (NSAID);

(iii) persons who had an allergic reaction (anaphylaxis) to the First Shot not to get the second dose; having minor side effects after the first vaccine - such as pain at the injection site, fever, fatigue, muscle aches or nausea - is normal and doesn't preclude you from getting a second dose, neither does 'COVID arm,' a rash, redness or swelling in the injection arm that may appear a week or more after your first shot;

(iv) persons with age less than 16 years; COVID-19 vaccines are only approved for people 16 and older (in the case of the Pfizer vaccine) or 18 and older (in the case of the Moderna and Johnson & Johnson vaccines); but later "Everyone 12 years of age and older now eligible to get a COVID-19 vaccination," says the CDC.

(v) persons currently having COVID as she/he must self-isolate for 10 days after the symptoms begin; and

(vi) others such as People who have weakened immune systems, underlying medical conditions at increased risk from COVID-19, who have autoimmune conditions, have previously had Guillain-Barre syndrome (GBS) and who have previously had Bell's palsy.

Precautions and monitoring reports of severe allergic reactions - "CDC has put safeguards in place by giving recommendations for COVID-19 vaccination providers about how to prepare for the possibility of a severe allergic reaction. Says the CDC: "If someone has a severe allergic reaction after getting vaccinated, their vaccination provider will send a report to the Vaccine Adverse Event Reporting System (VAERS). VAERS is a national system that collects reports from healthcare professionals, vaccine manufacturers, and the public about adverse events that happen after vaccination. Reports of adverse events that are unexpected, appear to happen more often than expected, or have unusual patterns are followed up with specific studies."

The "Siracusa Principles" are a foundation on which to build especially in emergencies state restrictions on rights. These are only justified when they support a legitimate aim and are: provided for by law, strictly necessary, proportionate, of limited duration, and subject to review against abusive applications. Recognizing this gap, some global institutions - including UNAIDS and the Global Fund—have issued guidance on human rights and Covid-19. (Elechi & Offiah, 2021)

Conclusion

As soon as possible! "When you get a COVID-19 vaccine, you are choosing to protect yourself and make a difference for your children, parents, grandparents, and other loved ones," says the agency, "Millions of people in the U.S. have already received a COVID-19 vaccine. The CDC and the vaccine maker agree has "extreme confidence in the vaccine potency and efficiency. For a community to be fully protected, most community members need to get the vaccine. With the COVID-19 vaccine shots going into arms, people are lining up to do their part to end the pandemic. Getting vaccinated against COVID-19 will help protect you from COVID-19, and it may also protect the people around you." The combination of non-pharmaceutical measures including physical distancing, hand hygiene, use of masks, quarantine and isolation of cases pending the availability of a specific drug for treatment should be implemented to decrease the burden and the consequent strain on the existing health system globally and particularly in Nigeria.

Recommendations

1. Rigorous and adequate clinical trial for drug safety and effectiveness in randomized, controlled trials which remain fundamental measures to protect the public from drugs that are ineffective, unsafe, or both need be embarked upon by the ministries of health and WHO.
2. All nations through their health agencies must also craft measures to cope with the challenges brought on mankind together.
3. The associations of the business enterprises reporting increase in revenue with higher proportions of them in the utilities, financial and insurance and human and health services sectors registering revenue gains over the course of the pandemic should not allow them drop but ready to assist in sourcing for credit facilities for continual success.
4. More vigorous single-dose vaccines against the pandemic to be purchased with monetary incentive attached by governments of various nations.

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IMPACT OF COVID-19 PANDEMIC ON SECONDARY EDUCATION IN RIVERS STATE, NIGERIA

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Abstract

At a period when Nigerian schools were temporarily closed due to the COVID-19 outbreak, this paper explored and focused on the nature of the education system and its many shortcomings. The COVID-19 epidemic had a significant influence on Nigeria's educational system, notably in Rivers State. With the exception of a few private institutions, which immediately transitioned to virtual learning platforms, all instructional activities were ceased. It also highlighted differences between Nigerian students and international students. The epidemic gave the country a chance to assess the status of its educational system. Prior to the outbreak, the Nigerian education system in primary, secondary, and most universities relied solely on traditional chalkboard instruction and learning. Electronic devices were not provided in public schools to enhance teaching and learning, nor were students allowed to possess or bring their own devices to school, particularly in elementary and secondary schools. Teachers and students were at a loss as to how to continue teaching and learning in the face of the COVID-19 outbreak, which resulted in a lockdown situation and school closure. The major objective of this paper was to examine COVID-19's issues and impacts on education in Nigeria, with focus on Rivers State.

Keywords: COVID-19, impact, education, pandemic

Introduction

Education's relevance to human development has been well established, with education functioning as a catalyst for both national and human capital development. Learning, information, skills, and habits are passed down through generations as a way of self-development. No nation can ever advance above its educational level. The importance of education for a country's economic, social, and moral growth cannot be overstated (Fägerlind & Saha, 2016; Griffin et al., 2012). Thus, it is of significant concern that education at all levels has been threatened since the emergence of the novel corona virus disease 2019 (COVID-19). Corona virus illness is a highly contagious sickness that has afflicted the global population since December 2019 and continues to do so. The illness propagated by droplets, and as of 6:36 p.m. CEST on October 4, 2021, there have been 234,809,103 confirmed cases of COVID-19 reported to WHO globally, with 4,800,375 fatalities (World Health

Organization, 2020). As a result, governments have implemented a variety of containment strategies, ranging from physical to social separation, to flatten the epidemiological curve and prevent morbidity and mortality from the COVID-19 (Barasa et al., 2020; Viner et al., 2020).

However, as in many countries worldwide, due to the COVID-19 pandemic lockdown, schools and institutions in Nigeria closed in March 2020 and only began reopening sometimes in October of 2020 in most parts of the country. However, Rivers State reopened a bit late due to the proactive measures by the state government to curb the spread. As a result of the lockdown, some higher institutions had to quickly move from the traditional face-to-face teaching method to virtual learning. Different countries have engaged in various measures to implement physical distancing, such as complete closure of the economy, including educational institutions (Nicola et al., 2020; UNESCO, 2020). The pandemic has affected all levels of the education system, from pre-nursery to higher education, in a manner that is of irreparable educational and economic implications (Lindzon, 2020).

Though school closure was intended to control the spread of the virus amongst the students, prevent carriage to other vulnerable individuals, and sustain public health, these closures have had widespread socioeconomic impacts (Lindzon, 2020; Wren-Lewis, 2020; Cauchemez et al., 2009). Furthermore, the far-reaching effects of social/physical distancing and the associated lockdown measures, as well as school closures, have thwarted the education sector and are expected to leave an indelible mark on the education system (Impey, 2020; Yinka & Adebayo, 2020; Nicola et al., 2020). Over 188 out of 195 countries have been implementing nationwide school closures and restricted education facilities (Nicola et al., 2020; UNESCO, 2020). It is estimated that more than 1,576,021,858, which constitute about 91.3% of all the learners across the globe, have been affected by the closure of educational institutions (Fong et al., 2020; Nicola et al., 2020; Sadique Adams & Edmunds, 2008; Brown et al., 2011; UNESCO, 2020). Apart from the impact on learners, school closures have high economic, health and social costs (Cauchemez et al., 2009; Brown et al., 2011; Wu et al., 2010).

This study aims at reviewing the impact of COVID-19 lockdown on education in Rivers State of Nigeria and give suggestions or recommendations that may be useful in improving the teaching and learning contingency strategies.

Corona Virus and Origin

Coronavirus disease 2019 (COVID-19), a novel disease, became known when it was identified as the causative agent in reported cases of patients with pneumonia admitted in hospitals in Wuhan, China, in December 2019 (Munster et al. 2020; Zhu et al. 2020). It is a contagious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first known case was identified in Wuhan, China, in December 2019 as similarly averred by Page, Hinshaw and McKay (2021). The disease has since spread worldwide, leading to an ongoing pandemic (Zimmer, 2021). During the initial outbreak in Wuhan, the virus and disease were commonly referred to as "coronav". The official names COVID-19 and SARS-CoV-2 were issued by the WHO on 11 February 2020. Tedros Adhanom explained: CO for corona, VI for virus, D for disease and 19 for when the outbreak was first identified (31 December 2019). Virus" and "Wuhan coronavirus".

COVID-19 is spread through airborne zoonotic droplet, and people can get infected when in close contact with the cough and sneeze of persons who have symptoms from the virus (Kumar et al. 2020). On 12th March, 2020, the WHO officially declared COVID-19 also known as coronavirus a pandemic (WHO, 2020). Due to this pandemic, educational institutions in most countries around the world were closed. Data from UNESCO showed that the peak in closure of schools was at the beginning of April 2020, when about 1.6 billion students were affected across 194 countries (UNESCO 2020). In March 2020, the Federal Ministry of Education in Nigeria directed the closure of all schools and they only began reopening in October, of the same year (Osamudiamen, 2020).

COVID-19 pandemic has affected higher education in Nigeria. The closure of schools meant that administrators of higher education had to come up with strategies to ensure that learning continues during the lockdown. Some Nigerian universities particularly the privately owned universities quickly transited from traditional face-to-face teaching method to remote education. As the period of total lockdown extended, more universities also switched to online teaching. Both the teachers and students had to adapt swiftly to the new mode of education as they were trained virtually on how to use distance learning tools. Teachers and students faced challenges in adapting to online classes and maintaining the minimal communication to support learning and development. Migrating to remote learning within a short period was difficult, especially in a developing country like Nigeria where advanced technology has not been well integrated into the educational system.

Areas of Academic Impacts of COVID-19 in Nigeria

1. Reduction of Enrolment and Increased dropouts

Study data identified that the school closure had negative impact on students' enrolment. In addition, the participants noted that many students were lost to teenage pregnancy, businesses and other distractions before schools reopened. This is because, most of the students were idle and needed means to expense their energy rather than staying confined to home routine activities.

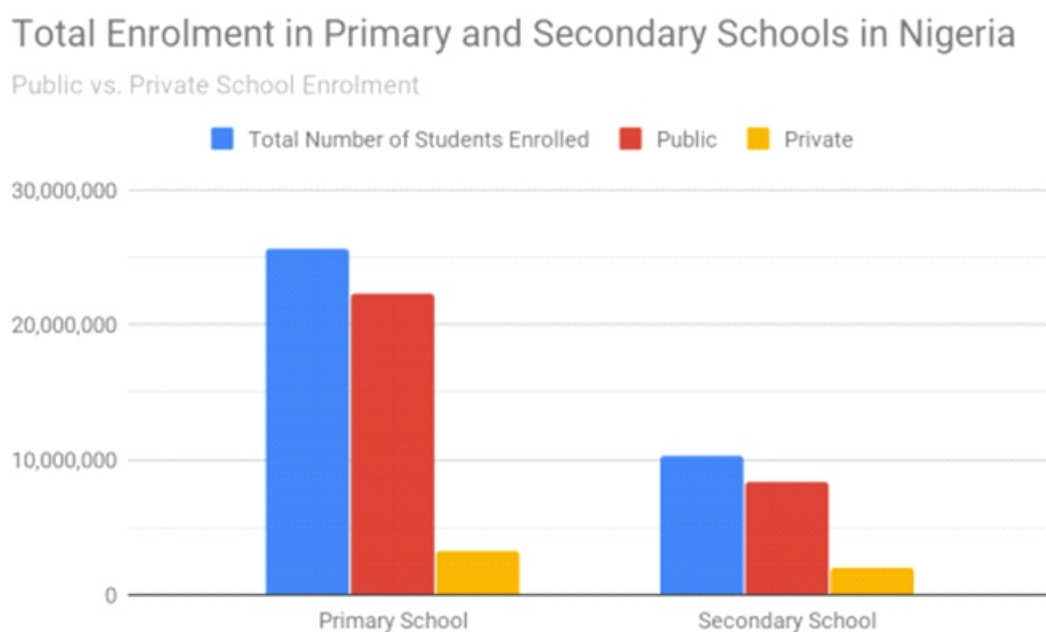


Figure 1. Enrolment Chart for Primary and Secondary School Students in Nigeria
 Source: Centre for the Study and the Economics of Africa (CSEA)

1. School Closure/Loss of Academic Session

As reported by UNESCO, about 35.9 million primary and secondary school learners are currently out-of-school as a result of the school closures. For primary schools, this number totals approximately 25.6 million students, of which about 87 percent (23.5 million) are students enrolled in public schools. The numbers are just as stark for secondary school learners. Of the roughly 10.3 million secondary school students who are out-of-school as a result of the closures, approximately 81 percent (8.4 million) of them are public school students.

The quantitative data of the study of Eze, Sefotho and Onyishi (2021), shows that parents (75%) and teachers (68%) believed that the students lost a school session and were strongly challenged due to COVID-19 pandemic school closure. Students stayed at home for about two school Terms due to complete school closure. This means that students were not promoted from one grade to the other as at the time they were supposed to be promoted.

2. Poor Learning

Most of the parents and school teachers were worried about poor learning among the students, and majority of the students submitted that they experience challenges in learning from home from findings of many scholastic researches of the impact of the pandemic. One of the teachers interviewed during the pandemic is quoted to have said: “school closure is impacting on the children's learning and achievement; I don't think the online efforts are working, except if it will do with time” “For now, getting involved in effective online teaching and learning is almost impossible for average Nigerian in primary or secondary schools, unless those in private schools”

The implication is that most stakeholders were of the view that online learning could not completely replace the regular school contacts especially for the primary and secondary schools in Nigeria. Though, the situation is slightly different with those in the institutions of higher learning as they were able to manage with the online teaching and learning. However, due to poor network in remote villages, inability to afford data and lack of frequent power supply, and many others, the method was not effective. Thesis similar to what Selbervik (2020) outlined as barriers related to school closure in developing countries. Oboh, Ighiwiysi and Oboh (2020) found that students in secondary school poorly utilized available online teaching and learning process for obvious reasons.

3. Loss of access to school-provided services

Beyond the missed learning opportunities, students in Nigeria are also losing access to the daily meals made available by the federally-funded school feeding programs. Nigeria has one of the largest school feeding programs in the world, with the World Food Programme estimating that in 2019, Nigeria's Home-grown Schools Feeding Initiative provided access to daily meals to over 9 million children in over 40,000 public schools. The benefits of school feeding programs extend beyond the immediate education benefits of the meals provided, such as encouraging enrolment in schools, and boosting learning. School feeding programs yield larger socio-economic benefits for children, their families, and society at large, two of which are especially pertinent to children of low socio-economic groups: boosting health and nutrition, and providing social protection and safety nets.

4. Leaving more kids behind

A longer-term impact of these school closures would be deepened educational inequality. While some international development partners (UNESCO, for example) have put together and provided access to ICT-based resources to foster learning, uptake will depend largely on the level and quality of digital and internet access, and language accessibility (as most programs are available in English or other non-native Nigerian languages). According to the Digital 2020 Global Overview Report published in January 2020, about 60 percent of Nigerians are not connected to the internet. The statistics for mobile phones, which could also be used as a learning medium, are more hopeful. According to the report, around 169.2 million people - 83 percent of Nigerians have access to mobile phone connections; however, of these, 50 percent - around 84.5 million people, reside in urban areas. The numbers are just as stark for secondary school learners. Of the roughly 10.3

million secondary school students who are out-of-school as a result of the closures, approximately 81 percent (8.4 million) of them are public school students (CSEA, 2020).

5. Poor/Unequal Access to Education Opportunities

Poor and unequal access to education opportunities were also identified and confirmed as a major challenge to education and learning during COVID-19. In other words, poor access due to poor infrastructures such as technological gadgets, electricity and network issues are almost general issues in Nigeria. Teachers and parents in Nigeria are rarely well prepared to handle online learning thereby limiting access to education outside the conventional school contact system. Worst still, those in rural areas could not have benefited from any form of e-learning.

7. Weaknesses of the Nigerian Educational System

One advantage of the COVID-19 pandemic is the exposure of the weaknesses of the Nigerian educational system comparatively to other parts of the world.

Poor/Lack of Technology for Distance Learning

Though the government claimed the use of technology such as phones, television, and radio for online learning as well as the introduction of diverse initiatives during the school closure period, many studies underlined the lack of or unavailability of supporting technologies for learners in primary and secondary schools and their parents. Moreover, these technologies are unaffordable to a majority of families with school-age children. In other words, distance learning is still a major challenge in Nigeria as there has never been adequate provision for effective e-learning platforms in public schools across the various tiers of our educational system; as transitioning learning from classrooms to homes may need a period of preparation in making available the enabling technologies (UNESCO, 2020). When majority of the learners and teachers lack the tools for virtual learning, it is practically impossible to embark on distance learning (Anene, Imam, & Odumuh, 2014; Iqbal, & Ahmad, 2010; Olutola, & Olatoye, 2015). The pandemic caught the education sector off guard, so there are no guidelines for planning and delivering online learning for primary and secondary schools (Phelps & Sperry, 2020). Therefore, this research outcome necessitates the provision of technological tools for learning in all primary and secondary schools. In a thematic analysis of teachers' perception of online learning during COVID-19 in Indonesia, Aliyyah et al. (2020) found four themes, including instructional strategies, challenges, support, and motivation of teachers.

Poor knowledge/skills on the parts of teachers and parents for virtual/e-learning.

In the study of Eze, Sefotho and Onyishi (2021), poor knowledge was identified by 74% of the parents and 66% of the teachers as a significant challenge to learning in primary and secondary schools. Supporting this result, qualitative information shows that most teachers are not skilled in using e-learning facilities. This concurs with Eze, Chinedu-Eze and Bello (2018) who indicated that e-learning facilities are under-utilized in most public tertiary institutions in Nigeria due to challenges including lack of inadequate training of users. Further, adopting e-learning during this COVID-19 pandemic demands up-skilling the users within a short time which was practically impossible.

Mitigation Strategies to Stem the Rising Learning Crisis

Some mitigation measures to be adopted are discussed below.

Distance learning through low-cost technology

Reaching the vulnerable population in Nigeria will require adopting multiple learning delivery modalities ranging from television, radio and SMS-based mobile platforms that are more easily available to the poor. With over 80 percent of the adult population having access to radios and phones, it would be possible to reach most children left behind with targeted instructions via these mediums. However, while online platforms offer personalized learning, other delivery modalities require a central planner, as well as coordination between all three tiers of government, and the private sector (media platform owners). This is where the role of the Ministry of Education will crucially extend beyond traditional policy making and regulations. The commissioners of education could help in the deployment and use of these tools within states, while the federal government coordinates the state efforts by plugging capacity and finance gaps. The government could draw on the experience of Sierra Leone, where the Ebola crisis led to school closures for about 9 months. To reach the most vulnerable and excluded children, the Government of Sierra Leone harnessed radios and televisions to deliver lessons. Whatever strategy the government chooses to incorporate, they must ensure that it is cost-effective (at least available within the home) and easy to use (children and their parents/guardians have some knowledge of it beforehand or can easily learn to use them).

Ensuring Access to Nutritious Meals and Vital Services

As part of palliatives to cushion the economic effect of the lockdown, the government announced that it intends to sustain the school feeding program to children. While this is reassuring, it is not yet known how this would be implemented. For example, will the government send daily prepared meals to households, or would the cost of the meals be monetized? By extension, there is a need to design a strategy to keep other educational support programmes flowing. The pandemic already underscores the importance of vaccinations, hence windows to vaccinate children for protection against diseases need to be open. Given that all children are at home, house-to-house vaccination could be deployed. Other vital services, such as providing sanitary pads for girls, can also be distributed via this means. Given that these services are an integral part of learning, scaling them up during these difficult economic times might be crucial. Since the major beneficiary of school feeding programmes are the poor, and given the economic shocks facing the entire household, it might be insufficient to reach only children within the household; the government might need to seek ways to provide meals for entire households.

Reaching the most vulnerable

In keeping the flow of these education support programmes, the educational needs of the hard-to-reach families could also be met. Lessons and homework can go together with physical deliveries of additional education support, while each family develops their homegrown strategy to cover the materials. Angola, Uganda and Zambia have already embedded this approach in their COVID-19 response strategy. The key requirement would be the conscious and active involvement of school administrators in the various government interventions.

Education Financing

The fiscal space to fund education has further shrunk with the shock on government revenue and economic downturn arising from the COVID-19 pandemic. Many items in the 2020 Education Sector appropriation bill, will not be implemented due to the drastic financial shortfall. Yet, more

funding is required to keep learning going or scaled- up education support programmes as part of the government's palliative measures. For the government, reducing costs will require re-prioritising its plans in light of this new reality. The most urgent needs at the moment will be improving teachers' motivation, learners' preparedness and galvanizing domestic digital and media enterprises. This needs to be complemented with innovative sourcing of learning infrastructure during this period. For example, reaching children through existing school and home appliances and gadgets will be more cost-effective. Greater involvement of domestic philanthropists and digital entrepreneurs can reduce the financial burden of sustaining learning through the crisis.

Tapping into global resources

The World Bank, UNESCO and other development partners have already rolled out a number of education resources that developing countries can readily deploy. The Edtech industry in general is also providing free online platforms to engage directly with students and to assist school administrators and governments to identify technological solutions that support remote learning. On a larger scale, the countries should explore international loans and grants facilities for education as part of mitigation and recovery plans in weathering the COVID-19 crisis.

Conclusion

The COVID-19 lockdown had a significant influence on Nigerian education. For parents, students, and instructors, the necessity for unique emergency teaching and learning approaches, as well as the transition to remote learning during the epidemic, was difficult. A key disadvantage of virtual learning over traditional face-to-face instruction was the lack of student–student and student–teacher interactions. Other challenges unravelled by this study include school closure/loss of academic session, poor learning, poor/unequal access to education opportunities, difficulties associated with home-schooling, poor/lack of technology for distance learning, urban-rural divides in resource distribution and access, poor knowledge/skills on the part of the teachers and parents. In addition, it was observed that COVID-19 negatively impacted school enrolment and created or widened achievement gaps and inequality in education, among others.

Recommendations

1. As most students are relatively new to virtual learning, there is need for a student-friendly guide aimed at helping students with processes as well as the methods of assessment.
2. Teachers should develop interactive online classes skills needed to limit student's distraction during the pandemic.
3. Nigerian government, management of higher institutions and telecommunication industries should collaborate to subsidize cost of internet for both students and teachers.
4. Telecommunication industries should increase internet coverage and broadband services so as to overcome Internet-related issues.
5. This is the first time most institutions in Nigeria are using distance learning tools and it is recommended that the Federal Government of Nigeria and the Ministry of Education should see the COVID-19 pandemic lockdown as an opportunity to invest and promote virtual learning in Nigerian institutions by providing various technological gadgets across all levels of education.
6. A short course addressing the usage of online learning management systems: Zoom, Google Classroom, Edmodo, etc. should be added to the school's curriculum.
7. Most students of institutions in Nigeria are from humble homes and are unable to afford a laptop or smartphones, while some of them reside in regions with poor Internet connections. Therefore, the universities should lend laptops/tabs to students from the school libraries with clear instructions that these devices must be returned in good conditions within certain periods that like it is with library books.

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COVID-19 PANDEMIC AND HEALTHCARE SERVICES IN NIGERIA: CHALLENGES AND WAY FORWARD

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Abstract

Healthcare service is key to the well-being of any society as it deals with health problems by providing services of promotion, prevention, treatment and restoration of health. However, from the onset of the outbreak of the COVID-19 pandemic, and its claim of several lives in countries with the most sophisticated healthcare systems and services, the poor and pathetic state of the Nigeria healthcare system has become more glaring. COVID-19 is a novel and contagious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) with common symptoms ranging from fever to dry cough, tiredness, chest pain or pressure, difficulty in breathing among others. It is spread through airborne zoonotic droplet, and people can get infected when in close contact with the cough and sneeze of infected persons. The ravaging nature of the pandemic, marked by increasing cases and high death toll, elicit fears and concern among Nigerian citizens and the government. This paper employed exploratory and qualitative approach design to examine the effect of COVID-19 on the healthcare services, with specific consideration of the challenges, expectations of the government in supporting and improving the healthcare sector with modern equipment/facilities and training of health workers.

Keywords: COVID-19, pandemic, challenges, healthcare, services

Introduction

The common saying that health is wealth is very true and key to the development of an individual, community and the nation. Thus, a nation that neglects its health sector is bound to face huge challenges as only healthy citizens can form a strong and formidable workforce. This accounts for the reasons developed countries pay special attention to the training, retraining, retention and remuneration of their healthcare personnel; and to ensure the health facilities are properly equipped. Some also ensure affordable health insurance scheme for her citizenries.

However, the case is very different with Nigeria. The Nigerian healthcare sector is very poor for obvious reasons ranging from dilapidated structures, to shortage of personal and poor remuneration of Healthcare workers. Also, the few available Healthcare outfits are under-equipped and overcrowded, not able to meet with the demands of the overwhelming population.

Globally, the COVID-19 pandemic is a major public health concern to all countries of the world even those with the most sophisticated and top-notch facilities. Since the outbreak of the COVID-19 pandemic, the poor nature of the Nigeria healthcare system has become more glaring. The ravaging nature of the pandemic, marked by a high death toll, has caused a lot of panic and concern to Nigerian citizens as they are aware of the poor state of the Nigerian Healthcare system in combating the virus (Obi-Ani et al., 2020). These fears are not necessarily as a result of the lethal nature of COVID-19 but rather, they are fuel by certain conditions amongst which include: an inept and unconcerned leadership, accompanied by dilapidated health institutions characterized by poor working conditions and incentives. It is in lieu of these unhealthy conditions that the dreaded disease found its footing in the Nigerian environment. Against this background, this paper critically reviews the effect of the COVID-19 pandemic on the Healthcare services in Nigeria with the objectives of evaluating the challenges and to recommend the way forward.

COVID-19

Coronavirus disease 2019 (COVID-19) is defined as illness caused by a novel coronavirus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; formerly called 2019-nCoV), which was first identified amid an outbreak of respiratory illness cases in Wuhan City, Hubei Province, China. It was initially reported to the WHO on December 31, 2019. On January 30, 2020, the WHO declared the COVID-19 outbreak a global health emergency. On March 11, 2020, the WHO declared COVID-19 a global pandemic. This illness caused by SARS-CoV-2 was termed COVID-19 by the WHO, and the acronym derived from "coronavirus disease 2019." The name was chosen to avoid stigmatizing the virus's origins in terms of populations, geography, or animal associations (Cennimo, 2021).

According to the Centre for Disease Control and Prevention (2020), People with COVID-19 have had a wide range of symptoms reported – ranging from mild symptoms to severe illness. Symptoms may appear 2-14 days after exposure to the virus. Anyone can have mild to severe symptoms. People with these symptoms may have COVID-19: Fever or chills, Cough, Shortness of breath or difficulty breathing, Fatigue, Muscle or body aches, Headache, New loss of taste or smell, Sore throat, Congestion or runny nose, Nausea or vomiting, Diarrhea etc.

The virus can spread from an infected person's mouth or nose in small liquid particles when they cough, sneeze, speak, sing or breathe. These particles range from larger respiratory droplets to smaller aerosols. One can get infected by breathing in the virus if he/she is near someone who has COVID-19; or by touching a contaminated surface and then your eyes, nose or mouth. The virus spreads more easily indoors and in crowded settings. This agrees with the position of Osamudiamen (2020) who averred that COVID-19 is spread through airborne zoonotic droplet, and people can get infected when in close contact with the cough and sneeze of persons who have symptoms from the virus.

Since the declaration of the coronavirus disease (COVID-19) outbreak to be a global public health emergency of international concern under the International Health Regulations by the Director-General of the World Health Organization (WHO) on 30 January 2020, the pandemic has continued to heighten across nations, continents and the world impacting the economy, health, institutions and every other sector of human endeavour- especially the health sector. In Nigeria as at 5th October, 2021, NCDC has tested 3,090,114 samples with 206,565 confirmed cases, discharged 194,475; still having 9,359 active cases and have recorded 2,731 death on the whole.

What then are healthcare services?

Healthcare Services simply refer to services provided for diagnosis, treatment or care of persons suffering from any physical or mental disease, injury or disability including procedures that are similar to forms of medical, dental or surgical care but are not provided in connection with a medical condition and includes any other service notified by the Government or appropriate authorities. Examples include: Mental health care, Dental care, Laboratory and diagnostic care, Substance abuse treatment, Preventative care, Physical and occupational therapy, Nutritional support, Pharmaceutical care. In other words, they are medical and healthcare services provided by any Person, including, but not limited to, services of physicians, nurses, therapists, dentists, or other licensed or unlicensed healthcare personnel, hospital services, skilled nursing facility services, comprehensive outpatient rehabilitation services, home healthcare services, residential and outpatient behavioural healthcare services, the provision of room, board and daily living assistance at licensed healthcare facilities, home care services, transportation to or from healthcare facilities, or the sale, assignment, lease or license of healthcare related equipment, prosthetics, pharmaceuticals or other goods and any other medical and healthcare goods and services which are covered by a policy of insurance or by any other healthcare program of a Governmental Authority.

Challenges of the Healthcare System Exposed by COVID-19

Top on the list of challenges of the Nigerian Healthcare Services exposed by the COVID-19 which need urgent attention include corruption and poor leadership, non-functional health insurance, weak and deficient infrastructure, dependence on donor countries for critical items such as vaccines, poor remuneration for medical and health workers, brain drain, and lack of functional equipment, poor primary Healthcare system, epileptic power supply.

1. Corruption and Poor Leadership

The aphorism that corruption is the bane of any society remains true and a factor that has affected and still affect the Healthcare sector in Nigeria. Health is wealth and key to the development of any nation and should be prioritized. However, the case is different in Nigeria. Leaders entrusted with public offices and converts public fund meant to important sectors such as health, education, etc to personal and public fund leaving the Healthcare sector in a severe poor state. No time in the chequered history of Nigeria has leadership failure been more brazen than in the face of the COVID-19 pandemic. In lieu of this, Nigerian leadership in its wobbling approach to tackling emergency, despite the timely knowledge of the ravaging disaster of the pandemic in other countries, has created a vivid picture of an uninspiring culture of leadership. More so, this inability to adopt a systematic approach to addressing the pandemic has generated immense concerns amongst Nigerian citizens due to the deliberate neglect of the country's healthcare system (Obi-Ani et al., 2020).

Historically, from 1970 till date, the country has made three major attempts at sustainable healthcare system via various outlets amongst which include: The Basic Health Services Scheme (BHSS) from 1975 to 1983; the District Health System (DHS) from 1986 to 1992 and the National Primary Healthcare Developing Agency (NPHCDA) from 1992 till date (Abosede & Sholey, 2014; Aigbiremolen et al., 2014). Nevertheless, despite these structures, no policy efforts have achieved a remarkable success at implementation; and this owes largely to a lack of political commitment that has led to an inadequate and inefficient financing, mal-distribution of the health workforce, weak and dilapidated infrastructures (Abosede & Sholey, 2014; Aigbiremolen et al., 2014), substandard drugs and equipment among other highlights. Fundamentally, these setbacks are with regard to Nigerian leaders' preference and patronization of foreign medical outfits which of course had become detrimental to health institutions in the country (Adebayo, 2020; Eme et al., 2014). Indeed, the dichotomy between the medical choices open to the country's leadership and the led accounts for the poor healthcare system in Nigeria. Moreover, the menace of the Covid-19 pandemic has further accentuated this reality and has exposed the aftermath arising due to the disdainful neglect of the country's healthcare system by poor leadership whose actions have affected the impoverished the nation.

In a wider context, the poor leadership style of Nigerian leaders since independence has affected the political, social, economic and health sectors; the dilapidation of the latter leading to an increased mortality rate in Nigeria. Thus, there is the need to grow the economy through the exploitation of the natural resources and investing the wealth in critical sectors of health and education. According to Obi-Ani (2010), an ailing economy is dreaded by those aspiring to assume the realms of power; especially as the economy of any nation is the hub upon which its entire government machinery is hinged. Contrarily, this dread has not been exhibited by Nigerian leaders who since the country's independence have shattered the hopes of its citizens with gross corruption, tribalism and nepotism (Achebe, 1983). Similarly, the elite group produced by the country's colonial rulers, having no revolutionary bent, replicated this same colonial violence (Njoku, 2014). As a result of this replication, citizens have become disenchanted especially considering the country's health sector which has not received adequate attention despite the

numerous budget channeled to it (Eme et al., 2014; Emuakpor, 2010; Ochulor, 2011; Ogbeidi, 2012). Thus far, various scholars have focused on corrupt leadership practices of Nigerian leaders without a detailed and in-depth study on the nexus between the health sector and this failure.

Nigeria's healthcare policies are germane. From the primary healthcare to secondary and tertiary healthcare schemes are all in place. But they are malfunctioning. There are areas of life that should not be politicized. Healthcare sector should not be associated with quota system, favouritism and corruption. Every personnel from cleaners to consultants must be on merit. Any compromise in healthcare could lead to loss of life. But a hospital administrator sees the position as an opportunity to employ his relations in positions they are least qualified. This is the bane of Nigeria. Again, most public officials are law breakers in Nigeria. A situation whereby senators and other government officials returning to the country, refused to be tested for COVID-19 at the airports and quarantined, to say the least is embarrassing. It took more than a month after the first index case was detected in Lagos for the federal government to close the borders and implement lockdown in parts of the country. What is worst being that some government officials charged with distribution of palliatives to the indigent, saw it as an opportunity to enrich themselves. Nigerians want to profit from fellow compatriots' distress.

2. Non-Functional Health Insurance

One major challenge of the health sector accentuated by the COVID-19 pandemic is poor or non-functional health insurance for health workers who put their lines and those of their families on the line in combating the pandemic and other health challenges in the country. In a documentary interview- "Addressing the challenges in the health sector exposed by COVID-19" by the Guardian Newspaper, Emeziele the Governor of Central Bank of Nigeria said a study by the World Health Organisation (WHO) revealed that only four per (4%) cent of Nigerians had access to healthcare insurance. He said that besides food, healthcare expenses were a significant component of average Nigeria's personal expenditure. According to him, out-of-pocket expenses on healthcare amounted to close to 76 per cent of total healthcare expenditure. He said at such a level of health spending, individuals, particularly those in rural communities, might be denied access to healthcare services. He further stressed the need for improving access to healthcare for all Nigerians. The Governor also noted that "a key factor that has impeded access to healthcare for Nigerians is the prevailing cost of healthcare services." The CBN governor then advocated expansion of the insurance net to capture Nigerians not covered by existing health insurance schemes especially Healthcare workers. According to him, this can reduce the high out of pocket expenses on healthcare services by Nigerians. He said that it would help to increase the pool of funds that could be invested in building healthcare infrastructure and improving the existing welfare package of healthcare workers (Muanya, 2021). This underscores the lack of health insurance that should be given the Healthcare workers so they can give their all to serving our country.

Chairman, Evercare Hospital Lekki Limited, Mr. Tosin Runsewe, said to properly address the myriads of challenges in the health sector and ensure universal health coverage, health insurance has to be mandatory. Runsewe, who was one of the panelists, representing the private sector, said if the National Health Insurance Scheme (NHIS) were made mandatory, it would take care of 50 per cent of the 200 million populations in Nigeria. He said social health insurance programme that will take care of the indigent people and those in informal employment will now take care of the remaining 50 per cent of Nigerians (Odugbemi & Ahmed, 2021).

3. Weak and Deficient Infrastructure

COVID-19 has further revealed the obvious infrastructural deficit and incompetency in healthcare systems of low- and middle-income countries like Nigeria. Even in developed countries, like the

United States of America, healthcare systems are not spared by the overwhelming impacts of COVID-19 cases on their infrastructures. Three key components are required in Public health infrastructure to plan, deliver, and evaluate public health services. These components are an adequate qualified work-force, reliable data and information systems, and capable and coordinated agencies (Office of disease prevention and health promotion, 2020). These are all lacking in Nigeria. Before the COVID-19 pandemic, the health infrastructures and services in Nigeria were poor and inadequate despite the public health challenges in the country, like child and maternal mortality, malnutrition, and deaths from non-communicable diseases, among others. Nigeria, like other developing countries, has continued to suffer from small budgetary allocation for health, mismanagement of funds, and rural-urban disparity in the few existing healthcare infrastructures (Edeme et al., 2017). These were further amplified by the COVID-19 as there were no sufficient facilities to quarantine and adequately care for the infected patients.

4. Dependence on Donor Countries for Critical Items such as Vaccines

It is a common fact that the leaders, politicians and the well-to-do in Nigeria seek medical attention abroad. They patronize India, China, UK, America etc leaving the Nigerian Healthcare system in a state of reckless abandon. Worst still, our Healthcare system depends on other countries for equipment, like the ventilator, drugs, vaccines etc but were disappointed when the pandemic struck and all countries were struggling to attend to their citizens within the limit of the available resources. It became very difficult to import as we usually do. This exposed our backwardness medically and total dependence on developed countries. So many people died due to shortage of ventilators, drugs, and other necessary medical equipment as the borders were closed and many countries could not engage in import and export of commodities. This was because we do not produce in Nigeria. We depend solely on importation of science and technology from other countries even with limited resources and manpower than we have.

There is urgent need to produce locally most of the drugs required in Nigeria in partnership with big pharmaceutical companies. If there is a global lockdown, closure of borders around the world for one year, the drug supply chain will run dry. The political leadership lacks every sense of patriotism otherwise Nigeria with its huge population and resources should have at least one state-of-the-art referral hospitals manned by qualified Nigerians in each state of the federation. It is scandalous that President Musa Yar'adua died in a Saudi Arabia hospital in 2010 while in 2017, President Buhari spent over three months in a London hospital receiving treatment. Despite all these, there is no single referral hospital that can handle whatever health challenge of a Nigeria president without rushing abroad. Recently, President Donald. J. Trump contracted coronavirus and within three days of admission in their military hospital, he regained his health. Nigerians and indeed the political leaders spend over 1 USD billion dollars annually on medical bills abroad (Obi-Ani et al., 2020). With these, does anyone still doubt while our economy is dwindling every day?

5. Poor Remuneration for Medical and Health Workers

Nigeria, compared to developed countries pay peanuts to health workers despite the daily hazards to which they are exposed even during the peak of the COVID-19 pandemic. This explains why Nigeria is losing several doctors and other health practitioners to other countries of the world where pay and condition of service is appreciable. The exodus of health workers from this country at every available opportunity calls for concern. Unfortunately, relevant authorities are careless as they get attended in foreign lands when they are sick using public fund. As such, they are careless and carefree about the pay and condition of service for health practitioners in the country. It ought not to be so. During the pandemic due to boarder closure, so many of them died because the state of our facilities is poor and poorly managed. For months doctors have been on strike due to poor

remuneration yet, the government and relevant authorities are not bordered. Poor Nigerians die almost every day unattended.

6. Poor Data / Record System

One major challenge that the Nigerian government over the years have failed to address is poor data and record system. The country does not have an accurate record of all citizens not even that do visit health facilities. Even though there are registers in the hospitals, they are not properly stored or managed. There are several cases of misplaced files or folder from time to time. Moreover, the Nigeria system still depends largely on analogue method of documentation involving physical papers, folders, registers etc. COVID -19 pandemic clearly revealed how poor our data system has been. Cases were largely under-recorded as Nigeria does not have data base with basic information of her citizens.

Against the rapidly evolving situation of the pandemic, many countries are facing challenges in the availability of accurate and up-to-date social and behavioural data. Few countries are capturing social and behavioural data in a way that meets the needs of the country response teams. Defining methodological approaches and designing tools can be a time-consuming and challenging task for resource-constrained teams. In response to this situation, WHO has developed the “Social and Behavioural Insights COVID-19 Data Collection Tool for Africa” (hereafter referred to as “the tool”). Yet, in Nigeria, not so much is done in keeping and maintaining accurate records of patients in a digitalized form that could be accessible if the need arises, across all registered health outfits as it is in developed societies.

8. Poor Primary Healthcare System

In a documentary by Odugbemi and Kadaria (2021), a consultant medical doctor and former Ogun State commissioner for health, Dr. Olaokun Soyinka, said the greatest challenge faced in the Nigeria health sector is to resurrect primary Healthcare. “It is the crux of healthcare delivery. It is the orphan child because it is not owned by anybody. There are three tiers of government contributing to it, that is the Federal, state and Local Government Area (LGA),” he said. Rapid rejigging and revamping of the primary Healthcare are needed to address the mirage of health concern facing the country. This is because, the PHC system is the closest to the people and must be thoroughly and adequately furnished to address most health-related issues.

9. Shortage of Medical Personnel

One major challenge of the health sector in Nigeria is shortage of personnel. We do not have enough medical staff to attend to our population. In Runsewe in the documentary by Odugbemi and Kadaria (2021) also identified shortage of medical personnel as one of the major challenges faced by the health sector. “We don't have enough medical personnel. We graduate about 3,000 doctors yearly in Nigeria but we probably need 10,000 people,” he said. There is need for more health workers to man our medical facilities.

Impacts of COVID-19 on Nigerian Healthcare System

The law of karma is a natural law of cause and effect which infers that every action elicits a reaction and agrees with Newton's third law of motion- to every action, there is an equal and opposite reaction. Following this line of thought, corollary karmic consequences in Nigeria, with relation to the deliberate abandonment of the nation's primary healthcare system, have been self-evident with malaria fever and other preventable and treatable diseases killing more people than COVID-19 pandemic. This karmic backlash, emanating from the lack of political will on the part of the elites to address the primary healthcare challenges, underscores the need to revitalize the healthcare sector

before it is too late. The lockdown and cessation of routine activities with its concomitant consequences as regards income reduction, escalation of hunger, boredom, rise in suicide, upsurge in insecurity, paranoia, buttresses the need for local production of drugs, medical equipment such as ventilators, surgical masks and even vaccines to treat epidemic and pandemic diseases (Obi-Ani, Ezeaku & Ikem, 2020).

At the international scene, the coronavirus engendered lockdown has caused a meltdown of global economic activities of which Nigeria's major export of crude suffered huge losses. Consequently, this decline in economic activities has led to a drastic fall in revenues accruing from oil sale in oil-dependent nations like Nigeria; thereby plunging the country into economic recession (Emefiele, 2020). At the domestic scene, the shutdown has caused economic difficulties such as hunger and business closure, with its attendant frustration marked by a rise in suicide cases, loss of jobs, high blood pressure and the cessation of notable social events such as religious events due to social distancing; leading to all forms of health challenges overburdening the health sector that is epileptic and understaffed even before now.

Consequently, hundreds of deaths were recorded in the country with several deaths occurring in remote villages off record. Evidently, this is another implication of leadership failure that is associated with the poor healthcare system. Indeed, the coronavirus pandemic is a wake-up call for Nigerian government to revitalize its hospitals and healthcare system, as the flu has forced the rich to stew in their own juice with world-wide ban on flights which prevented few rich Nigerians from seeking medical care abroad. The casualties of the rich and powerful Nigerians that succumbed to COVID-19 include should constantly remind us of the necessity to all work together to achieve better Healthcare system. It is possible that if the leaders, who died due to COVID-19 had encouraged state-of-the-art hospitals while in office, their lives and those of fellow compatriots could have been spared the affliction of the virus or survive the disease.

Conclusion

The coronavirus pandemic exposed the poor and unfortunate state and condition of Nigeria's healthcare system. The rot has been visible over the years, yet no remedial steps had been taken to address them. From lack of basic equipment in hospitals, to lack of essential drugs in the shelves and epileptic power supply and poor remuneration of medical personnel, the deterioration had persisted. Government after government have refused to address the pathetic situation. Many Nigerian doctors have agonized losing patients due to lack of appropriate equipment, fake drugs and electric power going off in the midst of major operation in the theatre. This has forced many health workers in Nigeria to migrate to Europe, United States and Saudi Arabia under better conditions of service than is obtainable in Nigeria. The saying that health is wealth and a healthy nation is a wealthy nation makes little or no meaning to government officials in Nigeria. Virtually all top government officials and their family members are routinely sponsored abroad for medical check-ups at government expense- using public funds. That accounts for the reason they pay less attention to public healthcare system in Nigeria.

The COVID-19 pandemic should have marked the critical juncture in Nigeria healthcare scheme. This is the moment the country ought to turn the corner for good. But like every other issue afflicting Nigeria, once the emergency abates, the health challenges confronting the country will be swept under the carpet. The coronavirus should awaken in the government the need for health security. The coronavirus pandemic is an opportunity to revitalize our healthcare system as we may not be lucky next time.

Recommendations

Based on the issues examined by this paper, the following recommendations are made:

1. The National Health Insurance Scheme (NHIS) should be made mandatory for all health workers and the entire workforce of Nigeria.
2. The primary Healthcare in the country in our country should be resuscitated and sustained to cater for the needs of the public,
3. More public-private partnerships must be encouraged to meet with the demands of our overwhelming population,
4. Local production of essential medical tools such as vaccines and protective personal equipment (PPE), drugs must be encouraged and financed by the government and or in partnership with private sectors.
5. Corruption and all sorts of nepotism must be kept far away from the health sector in terms of employment and appointment of relevant authorities within the health sector.
6. There is the urgent need for the rehabilitation of the Nigerian healthcare system towards curbing the current pandemic and to prevent the spread of similar pandemic in the future through deliberate structures and health promotion programmes across the country.
7. If it be possible, government officials and their dependents should be bound from traveling abroad for educational and medical purposes so they can fix the Nigerian system.
8. There should an immediate review of the remuneration of Healthcare workers across all levels to encourage dedication and total commitment to duties.
9. There is need to train more medical personnel to reduce the gap of the ratio of medical staff (doctors) to patients.
10. Proper digital database should be maintained across all health facilities and outfits to accurate record of patients and their progress.

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