Assessment of Water Quality of Some Private Borehole in Port Harcourt, Rivers State
Case Study, Diobu Community.

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Abstract— This study investigated the assessment of water quality of some private borehole in Port Harcourt metropolis case study Diobu Community. Four research questions and four hypotheses guided the study.

The related literature review was done under the theoretical/conceptual, empirical studies and summary which identified the assessment of water quality of some private borehole in Port Harcourt metropolis. Descriptive survey research design was adopted for the study.

A 40- item structured questionnaire development by the research was used. Questionnaire was used for data collection, Descriptive statistic of mean and standard deviation were used to answer the research question while chi-square was used to test the hypotheses at 005 level of significance. The finding indicated that there is no significant mean difference in the causes of water contamination of private borehole in Port Harcourt metropolises. The study revealed that the groundwater pollution causes contamination of water in private borehole. Some private borehole owner in Diobu community do not test the quality of their boreholes. It is re-commended that standard measures should be taken by the appropriate authorities to ensure proper treatment of the water to safeguard the health of the innocent consumers.

Index Terms— Borehole, Water Quality, Contamination, Port Harcourt.

I. INTRODUCTION

Groundwater which is also the source of private borehole water supply is one of the most important resources available to humanity; therefore it is more than necessary to provide a tool that can assess its quality over space and time. Groundwater exists below the surface of the ground in the spaces between particles of rock or soil, or in the crevices and cracks in rocks, usually within 100 meters of the surface of the Earth. Groundwater plays a substantial role in water supply, in ecosystem functioning and human well-being. Worldwide, 2.5 billion people depend solely on groundwater resources to satisfy their basic daily water needs, and hundreds of millions of farmers rely on groundwater to sustain their livelihoods and contribute to the food security of so many others.

Groundwater supplies are diminishing, with an estimated 200/o of the world’s aquifers being over-exploited, leading to serious consequences such as land subsidence and saltwater intrusion in coastal areas. The major sources of pollution in streams, rivers and underground water arise from anthropogenic activities largely caused by the poor and uncultured living habit of people as well as the unhealthy practices of factories, industries and corporate bodies; resulting in the discharge of untreated effluents and waste. Rivers state is a wetland in the Niger delta with likely serious problems of drinking water. Groundwater studies in some areas in Rivers State have shown increased levels in Total Dissolved Solids (TDS) (up to 2900mg/L), high hydrocarbon content oil and grease (71 mg/L in 2006 compared to 1.8 mg/L recorded seventeen years earlier) are reported to be some of the groundwater problems according to Ayotamuno and Kogbara (2010 and 2011) had reported iron and chloride elevation as groundwater issues and this was corroborated by Ophori et al (2012). Similar problems as reflected in Bayelsa, Delta and Rivers States were also reported by Arnangabar and Ejenma (2013), Edet(2014), and Amadi ci al.(2015).The principal goal of groundwater monitoring and management in developing countries is to assess and manage the water resources that are available. Groundwater is an important source of drinking water for more than half of Nigeria’s population and nearly all its rural population; it is generally a very good source of drinking water because of the self-puriﬁying properties of the soil, therefore there is the need for regular monitoring and assessment of these drinking water sources. This is because monitoring provides data on groundwater quantity and quality and it is an integral aspect of groundwater management (2016)-(2017). However, the quality assessment of private boreholes in some selected community in Port Harcourt Metropolis has not been reported, hence, this study is aimed at assessing the groundwater quality samples from Diobu Community to provide baseline data which will be used as a guide for future monitoring and to determine the extent of contamination by comparing results with local and international standardized limits.

Groundwater sources are being increasingly used as drinking water yet, testing to see whether the water is of good quality is almost non-existent. Although, it is true that soils generally function to reduce the effect of microorganisms by a simple ﬁltration mechanism, especially larger bacterial and protozoa, pollution of groundwater by micro-organisms, especially the located near septic tanks or landfills.
STArament of the Problem
Groundwater sources are being increasingly used as drinking water, yet testing to see whether the water is of good quality is almost non-existent. Although, it is true that soils generally function to reduce the effect of microorganisms by a simple filtration mechanism, especially larger bacterial and protozoa, pollution of groundwater by microorganisms, especially the located near septic tanks or landfills significantly do occur.

Objective of the Study
The aim of this study is to assess the water quality of some private borehole in Port Harcourt metropolis using questionnaire method this was achieve to:
1. Access the water quality in Port Harcourt metropolis.
2. Examine the causes of contamination of private borehole water.
3. To examine the effect of private borehole contamination
4. To determine the possible contamination control measure of private borehole water in Diobu Community.

Research Questions
1) What is water quality in Port Harcourt metropolis?
2) What are the causes of contamination of private borehole water?
3) What is the effect of private borehole contamination?
4) What are the possible contamination control measures of private borehole water in Diobu Community?

Hypotheses
The follow hypotheses were formulated and tested at 001 level of significance.
Ho1: there is no significant mean difference in the water quality rating among respondent based on the demographic variables.
Ho2: there is no significant mean difference in the casus of water contamination of private borehole based on demographic variables.
Ho3: there is no significant mean difference in the effect of private borehole contamination based on demographic variable.
Ho4: there is no significant mean different in the control contamination private borehole water based on demographic variable.

Table 1: Summary of mean rating of the water quality in Diobu Port Harcourt metropolis

| S/N | WATER QUALITY | SA | A | D | SD | Mean | STD |
|-----|---------------|----|---|---|----|------|-----|
| 1   | Most of the private borehole in Diobu have taste | 86 | 62 | 28 | 19 | 3.10 | 0.98 |
| 2   | The private borehole owners in Diobu Community do test water in the laboratory to determine the level of hazardous particles in water | 71 | 50 | 55 | 19 | 2.89 | 1.01 |
| 3   | The boreholes water in Diobu community contains black particles? | 21 | 149 | 16 | 9 | 2.93 | 0.61 |
| 4   | The sites in Diobu Community are Checked | 90 | 87 | 12 | 6 | 3.34 | 0.73 |
often by government and non-government standard organization

|   |   |
|---|---|
| 5 | Most of the Private borehole in Diobu Community uses granular magnesium dioxide (Salt) for water treatment |
|   | 72 61 57 5 3.03 0.88 |
| 6 | Setting and filtration is a physical process used in treating water quality |
|   | 70 58 48 19 2.92 1.00 |
| 7 | Private boreholes are used in Port Harcourt Metropolis, mostly in Diobu Community |
|   | 92 84 9 10 3.32 0.79 |
| 8 | Colour in water is primarily a concern of water quality for aesthetic reason |
|   | 143 45 3 4 3.68 0.61 |
| 9 | Water purification is a measure taken to ensure water quality treatments |
|   | 102 61 19 13 3.29 0.90 |
| 10 | Taste and odour are human perceptions of water quality. Human perception of taste includes sour (hydrochloric acid), salty (sodium chloride), sweet (sucrose) and bitter (caffeine) |
|   | 117 48 13 17 3.36 0.94 |
|   | Overall Mean Scores 3.18 0.45 |

SA - Means strongly Agreed
A - Means Agreed
D - Means disagreed
SD - Means strongly disagreed
STD - Means Standard Deviation

The result from Table 1 shows the summary of mean rating of water quality in Diobu Port Harcourt metropolis. It shows that the grand mean rating of water quality in Diobu Port Harcourt metropolis was 3.18, STD=0.45. Specifically, the result also shows that the mean rating of colour in water is primarily a concern of water quality for aesthetic reason. Coloured water give the appearance of being unfit to drink was 3.68, STD=0.61 whereas Taste and odours are human perceptions of water quality. Human perception of taste includes sour (hydrochloric acid), salty (sodium chloride), sweet (sucrose) and bitter (caffeine)? Was 3.36, STD=0.94.

Research Question: 2 What are the Causes of Contamination of Private Borehole Water.

Table 2: Summary of mean rating of Causes of contamination of private borehole water in Diobu Port Harcourt Metropolis.

| S/N | Causes of contamination of private borehole water | SA | A | D | STD | Mean | STD |
|-----|--------------------------------------------------|----|---|---|-----|------|-----|
| 1   | When hazardous waste is disposed or dumped in a site, it leads to contamination ground water after some time | 135 | 50 | 6 | 4 | 3.62 | 0.65 |
| 2   | Any borehole located close to a landfill site will produce contaminated water | 111 | 84 | 0 | 0 | 3.57 | 0.50 |
| 3   | Atmospheric pollutant is one of the agent of water pollution | 118 | 77 | 0 | 0 | 3.61 | 0.49 |
| 4   | Oil spillage in an area can directly or indirectly contaminate the ground water | 161 | 29 | 5 | 0 | 3.80 | 0.46 |

by government and non government standard organization was 3.34, STD=0.73, while Setting and filtration is a physical process used in treating water quality is a measure of the light-transmitting properties of water and is comprised of suspended and colloidal material was rated with mean score of 3.29, STD= 0.90, and Most of the Private borehole in Diobu Community uses Granular Magnesium dioxide (salt) for water treatment had mean rating of 3.17. STD=0.90.
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Chemicals like road salts, solvents used in the area are part of the source of ground water contamination. 3.69, STD=0.53 it also shows that when hazardous waste is dispose or dumped in a site, it leads to contamination of ground water after some time 3.62, STD=0.65, and also the mean rating of Atmospheric pollutant is one of the agent of water pollution 3.61, STD=0.49 and also the least Any borehole located close to a landfill site will produce a contaminated water was 3.57, STD =0.50

Research Question 3: What is the Effect of Private Borehole Contamination?

| S/ N | Effect of contamination of private borehole water | SA | A | D | STD | Mean | STD |
|------|--------------------------------------------------|----|---|---|-----|------|-----|
| 1    | Most of the disease that affects children in Diobu Community is traceable to contaminated water which they drink | 119 | 76 | 0 | 0 | 3.61 | 0.49 |
| 2    | Groundwater infected with hepatitis is the major cause of Hepatitis in human | 150 | 45 | 0 | 0 | 3.77 | 0.42 |
| 3    | Most children in our rural area are suffering from dysentery because of the intake of contaminated water | 108 | 86 | 1 | 0 | 3.55 | 0.51 |
| 4    | Any borehole that is not properly dug, or that is exposed to chemical flow can become poisonous to human consumption | 133 | 62 | 0 | 0 | 3.68 | 0.47 |
| 5    | When an area has a contaminated groundwater the land value will be depreciated | 95 | 76 | 24 | 0 | 3.36 | 0.69 |
| 6    | Contamination of groundwater reduces the nutrient of the land | 73 | 60 | 62 | 0 | 3.06 | 0.83 |
| 7    | An area with contaminated ground water cannot be used as an industrial area | 74 | 59 | 62 | 0 | 3.06 | 0.83 |
| 8    | Vegetations are affected when the groundwater is contaminated | 25 | 148 | 18 | 4 | 2.99 | 0.55 |
| 9    | The degree of Private borehole contamination is high in Diobu Community | 83 | 106 | 6 | 0 | 3.39 | 0.55 |
| 10   | Some private borehole water owner in Diobu community does not take care or wash their storage up to 10 years | 102 | 92 | 1 | 0 | 3.52 | 0.51 |
The result from Table 3 shows the summary of mean rating of Effect of Private Borehole Contamination in Diobu Community, It shows that the grand mean rating of Effect of Private Borehole Contamination in Diobu Port Harcourt metropolis was 3.37, STD=0.37 Specifically, the result also shows that the mean rating of ground water infected with hepatitis is the major cause of Hepatitis in human. 3.77, STD=0.42 where as any borehole that is not properly dug, or that is exposed to chemical flow can become poisonous to human consumption.3.68, STD=0.47, it also shows that Most of the disease that affects children in Diobu Community is traceable to contaminated. 3.61, STD=0.49, and also the mean rating Most children in our rural area are suffering from dysentery because of the intake of contaminated water. 3.55, STD=0.51 and also the some private borehole water owner in Diobu Community does not take care or wash their storage tank for up to 10 years 3.52 STD=0.51

**Research Question 4:** What are the possible Contamination control measures of Private Borehole Water in Diobu Community

### Table 4: Summary Of Mean Scores Rating of Control Contamination of Private Borehole Water in Diobu Community in Port Harcourt Metropolis

| S/ N | Control of contamination of private borehole water | SA  | A  | D  | STD | Mean  | STD |
|------|--------------------------------------------------|-----|----|----|-----|-------|-----|
| 1    | Government should always send their law enforcement agents, to make sure people abide with the law and regulation guiding quality of water | 98  | 93 | 4  | 0   | 3.48  | 0.54|
| 2    | Private borehole owner should ensure the cleanness of their storage tank always | 139 | 55 | 1  | 0   | 3.71  | 0.47|
| 3    | Dump sites should not be located close to resident area where it will affect water flowing to the borehole | 120 | 75 | 0  | 0   | 3.62  | 0.49|
| 4    | Due examination of water should be done periodically by the private borehole owners to detect when the water becomes contaminated | 140 | 55 | 0  | 0   | 3.72  | 0.45|
| 5    | Joint effort should put in place for cleaning of contamination in the environment | 115 | 67 | 9  | 4   | 3.50  | 0.68|
| 6    | Series of test should be done on groundwater of an area before that site can be chosen as borehole site | 107 | 88 | 0  | 0   | 3.55  | 0.50|
| 7    | Discharge of petroleum product in any community of Diobu or its environs should be reported to the appropriate quarters to avoid contamination of ground water | 117 | 78 | 0  | 0   | 3.60  | 0.49|
| 8    | Rearing of some animal like pig, cow etc should not be located near drinking borehole to avoid contamination of water through animal waste | 61  | 111| 21 | 2   | 3.18  | 0.66|
| 9    | Hazardous chemicals should not be disposed inappropriately | 81  | 80 | 34 | 0   | 3.24  | 0.73|
| 10   | Old boreholes which was a conversion from dug well to borehole should be closed down because of health implication of contaminated water | 88  | 76 | 31 | 0   | 3.29  | 0.73|

Grand Mean 3.49 0.34

The result from Table 4 shows the summary of mean rating of Control of Contamination of Private Borehole Water in Diobu Community, It shows that, the grand mean rating of Control of Contamination of Private Borehole Water in Diobu Community, was 3.49, STD=0.34 Specifically, the result also shows’ that the mean rating Due examination of water should be done periodically by the private borehole owner to detect when the water become contaminated. 3.72, STD=0.45 where as Private borehole owner should ensure the cleanness of their storage tank always.3.71, STD=0.47, it also shows that Dump sites should not be located close to resident area where it will affect water flowing to the borehole 3.62, STD=0.49, and also the mean rating Discharge of petroleum product in any community of Diobu or its environ should be reported to the appropriate quarters to avoid contamination of ground water 3.60, STD=0.49 and also the least and not the last was Series of test should be done on groundwater of an area before that site can be chosen as borehole site. 3.55 STD=0.50

**HYPOTHESIS TESTING**

H0: There is no significant mean difference in the water quality rating among respondent based on the demographic variables.

Table 1: Summary of the factorial Analysis of Variance on the mean difference in the water quality rating among respondent based on the demographic variables
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| Source              | Type III Sum of square | Df   | Mean Square | F     | Sig  |
|---------------------|------------------------|------|-------------|-------|------|
| Corrected           | 6.004a                 | 11   | .546        | 3.019 | .001 |
| Model Intercept     | 299.823                | 1    | 299.823     | 1658.731 | .000 |
| GENDER              | .010                   | 1    | .010        | .055  | .814 |
| AGE                 | .208                   | 4    | .052        | .288  | .886 |
| MARITAL STATUS      | 5.155                  | 3    | 1.718       | 9.507 | .000 |
| EDUC QUALIFICATION  | .047                   | 3    | .016        | .087  | .967 |
| Error               | 33.078                 | 183  | .181        |       |      |

Total: 2016.149 195
Corrected Total: 39.082 194

a. R Squared = .154 (Adjusted R Squared = .103)

The result from Table 1 shows the summary of the factorial Analysis of Variance on the mean difference in the water quality rating among respondent based on the demographic variables. It shows that only marital status (F1, 183 = 5.507, p < .05) as significant over mean difference in the water quality rating among respondent, whereas age (F4, 183 = .288, p > .05), gender (F1, 183 = .055) and Educational qualification (F3, 188 = .087, p > .05) were not significant over mean difference in the water quality rating among respondent.

H01: There is no significant mean difference in the cause of water contamination of private borehole based on demographic variables.

Table 2: Summary of the factorial Analysis of Variance on the mean difference in the cause of water contamination of private borehole rating among respondent based on the demographic variables

| Source              | Type III Sum of square | Df   | Mean Square | F     | Sig  |
|---------------------|------------------------|------|-------------|-------|------|
| Corrected           | .712a                  | 11   | .065        | .578  | .846 |
| Model Intercept     | 380.960                | 1    | 380.960     | 3397.004 | .000 |
| GENDER              | .140                   | 1    | .140        | 1.245 | .266 |
| AGE                 | .370                   | 4    | .093        | .826  | .510 |
| MARITAL STATUS      | .124                   | 3    | .041        | .368  | .776 |
| QUALIFICATION       | .043                   | 3    | .014        | .128  | .943 |
| Error               | 20.523                 | 183  | .112        |       |      |

Total: 2440.180 195
Corrected Total: 21.235 194

a. R Squared = .034 (Adjusted R Squared = -.025)

The result from Table 2 shows the summary of the factorial Analysis of Variance on the mean difference in the cause of water contamination of private borehole respondent based on the demographic variables. It shows that there were no significant mean difference in the cause of water contamination of private borehole based on marital status (F3, 183 = .368, p > .05), age (F4, 183 = .826, p > .05), gender (F1, 183 = .691, p > .05) and Educational qualification (F3, 188 = .128, p > .05) respectively.

H02: There is no significant mean difference in the effect of private borehole contamination based on demographic variables.

Table 3: Summary of the factorial Analysis of Variance on the mean difference in the Effect Of Private Borehole rating among respondent based on the demographic variables

| Source              | Type III Sum of square | Df   | Mean Square | F     | Sig  |
|---------------------|------------------------|------|-------------|-------|------|
| Corrected Model     | 2.007a                 | 11   | .182        | 1.359 | .196 |
| Intercept           | 365.125                | 1    | 365.125     | 2719.434 | .000 |
| GENDER              | .093                   | 1    | .093        | .691  | .407 |
| AGE                 | 1.059                  | 4    | .265        | 1.972 | .101 |
| MARITAL STATUS      | .348                   | 3    | .116        | .864  | .461 |
| QUALIFICATION       | .446                   | 3    | .149        | 1.108 | .347 |
| Error               | 24.570                 | 183  | .134        |       |      |

Total: 2239.152 195
Corrected Total: 26.578 194

a. R Squared = .076 (Adjusted R Squared = .020)

The result from Table 3 shows the summary of the factorial Analysis of Variance on the mean difference in the Effect Of Private Borehole rating among respondent based on the demographic variables. It shows that there were no significant mean difference in the effect of private borehole respondent based on marital status (F3, 183 = .368, p > .05), age (F4, 183 = .826, p > .05), gender (F1, 183 = .691, p > .05) and Educational qualification (F3, 188 = 1.108, p > .05) respectively.

H03: There is no significant mean difference in the effect of private borehole contamination based on demographic variables.
H04: There is no significant mean difference in the control of contamination private borehole water based on demographic variable.

Table 4: Summary of the factorial Analysis of Variance on the mean difference in the Control of Contamination rating among respondent based on the demographic variables

| Source        | Type III Sum of square | Df       | Mean Square | F      | Sig       |
|---------------|------------------------|----------|-------------|--------|-----------|
| Corrected     | 1.080a                 | 11       | .098        | .847   | .594      |
| Model Intercept | 386.078             | 1        | 386.078     | 3328.416 | .000      |
| GENDER        | .040                  | 1        | .040        | .348   | .556      |
| AGE           | .673                  | 4        | .168        | 1.450  | .219      |
| MARITAL STATUS| .048                  | 3        | .016        | .139   | .936      |
| QUALIFICATION| .272                  | 3        | .091        | .781   | .506      |
| Error         | 21.227                | 183      | .116        |        |           |

Total 2396.380 195
Corrected Total 22.3 07 194
a. R Squared = .048 (Adjusted R Squared = -.009)

The result from Table 4 shows the summary of the factorial Analysis of Variance on the mean difference in the Control of Contamination respondent based on the demographic variables. It shows that there is no significant mean difference in the control of contamination private borehole water based on marital status (F3, 183=.139, p>.05) whereas Age (F4, 183=1.450, p>.05), gender (F1, 183=.348, p>.05) and Educational qualification (F3, 183.781, p>.05) respectively.

SUMMARY OF FINDINGS
The key knowledge among water quality in Diobu Port Harcourt metropolis was that Most private borehole water in Diobu Community is full of little particles and greenish substance (M=3.68, STD=0.61) While the least was that considering the private borehole owner in the Diobu community do water testing in the lab to determine the level of hazardous particles in water. The key knowledge of Causes of contamination of private borehole water in Diobu Port Harcourt Metropolis is Chemicals like road salts, solvents used in the area are part of the source of ground water contamination. (M=3.69, STD=0.53) While the least was Radon gas is a natural pollutant that can cause serious problem to human or animals that consumes water contaminated with it. The key knowledge of Effect of Private Borehole Contamination Dibou Community in Port Harcourt Metropolis Groundwater infected with hepatitis is the major cause of Hepatitis in human. (M=3.77, STD=0.42) and the least was Vegetations are affected when the groundwater is contaminated. The key major knowledge of Control Contamination of Private Borehole Water in Diobu Community in Port Harcourt Metropolis, Due examination of water should be done periodically by the private borehole owners to detect when the water become contaminated is (M=3.72, STD=0.45), and the least is Rearing of some animal like pig, cow etc should not be located near drinking borehole to avoid contamination of water through animal waste. Gender has no significant influence on the control of water quality in Diobu Port Harcourt metropolis. Gender has no significant influence on the of Causes of contamination of private borehole water in Diobu Port Harcourt Metropolis. Gender has no significant influence on the Effect of Private Borehole Contamination Dibou Community in Port Harcourt Metropolis.

Gender has no significant influence on Control Contamination of Private Borehole Water in Diobu Community in Port Harcourt Metropolis.
Age has no significant influence on the knowledge of water quality in Diobu Port Harcourt metropolis. Age has no significant influence on the Causes of contamination of private borehole water in Diobu Port Harcourt Metropolis. Age has no significant influence on the Effect of Private Borehole Contamination Dibou Community in Port Harcourt Metropolis.

DISCUSSION OF FINDINGS
Table:1 Water Quality In Diobu Port Harcourt Metropolis
The result from Table 1 shows that water quality in Diobu Port Harcourt metropolis is that colour in water is a primary concern of water quality for aesthetic reason (M=3.68, STD=0.61) While the least was that considering the private borehole owner in Diobu community do water testing in the...
lab to determine the level of hazardous particles in water. The result from Table 1 shows that gender has no significant influence in water quality in Diobu Port Harcourt metropolis (F1, 183=0.55, p>0.05). The null hypothesis was retained at 0.05 alpha level. Age has no significant influence in water quality in Diobu Port Harcourt metropolis (F1, 183=0.288, p>0.05). The null hypothesis was retained at 0.05 alpha level. Marital Status has no significant influence in water quality in Diobu Port Harcourt metropolis (F1, 183=0.9.51, p>0.05). The null hypothesis was retained at 0.05 alpha level. Educational Qualification has no significant influence in water quality in Diobu Port Harcourt metropolis (F1, 183=0.87, p>0.05). The null hypothesis was retained at 0.05 alpha level.

Table 2: Causes of contamination of private borehole water in Diobu Port Harcourt Metropolis.

The result from Table 2 shows that Causes of contamination of private borehole water in Diobu Port Harcourt Metropolis is Chemicals like road salts, solvents used in the area are part of the source of ground water contamination. (M=3.69, STD=0.53) While the least was Radon gas is a natural pollutant that can cause serious problem to human or animals that consumes water contaminated with it. The result from Table 2 shows that gender has no significant influence that Causes of contamination of private borehole water in Diobu (F1, 183=1245, p>0.05). Age has no significant influence in the Causes of contamination of private borehole water in Diobu Port Harcourt Metropolis (F4, 183=826, p>0.05). The null hypothesis was retained at 0.05 alpha 1 Marital status has no significant influence in the Causes of contamination of private borehole water in Diobu Port Harcourt Metropolis (F3, 183=363, p>0.05). The null hypothesis was retained at 0.05 alpha level. Educational Qualification has no significant influence in the Causes of contamination of private borehole water in Diobu Port Harcourt Metropolis (F3, 183=128, p>0.05). The null hypothesis was retained at 0.05 alpha level.

CONCLUSION

The result showed that some of the parameter used was within normal range for the water samples in the study area were within the acceptable limits by W.H.O and FME standards for drinking water except the P value which was comparatively low in private borehole water samples.

RECOMMENDATION

It is therefore recommended that standard measures be taken by the appropriate authorities to ensure proper treatment of the waters to safeguard the health of the innocent consumers, total coliforms, and lead in the affected sites.

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