



Comparative Analysis of Different Boreholes Water Qualities in Kurutie and Kunukunuma Communities

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ABSTRACT: The comparative analyses of different boreholes water qualities in Kurutie and Kunukunuma communities have been done. The two boreholes' water was bottled in two separate bottles of 100cl cans and labelled Sample A and Sample B, and they were preserved in a cool place before it was transported to the laboratory for physical, chemical and biological analysis. The laboratory experiments carried out are pH, BOD₅, TDS, DO, Nitrate, Turbidity and Hardness respectively. The results of the experiment show that the borehole water of Kurutie has pH – 8.2, DO – 3.6mg/L, BOD₅ – 2.3mg/L, Conductivity - 417 μ S/cm, TDS – 208mg/L, Nitrate – 0.4mg/L, Turbidity – 3.0NTU and water hardness of 202.3mg/L. While that of the Kunukunuma borehole water contains pH – 7.1, DO – 3.0mg/L, BOD₅ – 1.9mg/L, Conductivity - 341 μ S/cm, TDS – 171mg/L, Nitrate – 24mg/L, Turbidity – 13NTU and water hardness of 122mg/L respectively. The results were compared to the WHO standard, and they are in agreement except for the water hardness of Kurutie borehole water, which is about 2.3mg/L higher. It was recommended that water treatment should be done on Kurutie water to reduce the water hardness because other studies have also proved these results to be true.

KEYWORDS: Comparative, Analysis, Different Borehole, Water, Qualities.

I. INTRODUCTION

Drinkable water is an important constituent for better health together with the development of social economy of man but it is a lacuna in several communities (Udom *et al.*, 2002). Precisely, none contaminated water is fathomless and restricted resources that man has found to cherish only now after years of polluted together with waste water (Sinderberg, 20023). The world's population cannot support outside accessibility to clean water (Brainstein, 2007). Therefore, it is pertinent to jointly perpend the water quality together with

quantity in the management of water resources (Xinghui *et al.*, 2009).

The water of borehole has become not appropriate for household utilization as a result of contaminants that makes it not proper for different usages (Agbaire & Oyibo, 2009). The purpose of assessing the quality of water is to avert health perils linked to the usage of water directly or indirectly, and the standard, together with the regulations for water quality, arises as a result of the necessity for the protection of human beings' health (Udom *et al.*, 2002; Minh *et al.*, 2011).

Borehole water is being promoted as a cardinal source of drinkable water across the populace of most of the localities in Nigeria. Because only very few people are able to get clean water (Getso *et al.*, 2018).

The accentuation of the essence of ground water as a source of suitable drinking water in Africa, and it is made up of two – thirds of the fresh water resources globally. Groundwater gives a commonsensible uniform provision for households and livestock together with irrigation utilizations (Chapman, 1996).

The source that can buffer the influence of rainfall changeability over all periods was stated by Carlow *et al.*, 2011. Practically, many dry together with near dry regions of Africa boreholes water is an avenue of covering with water inadequacies in those regions where rainfall is limited (Agbaire & Oyibo, 2009).

The comparable evaluation of borehole water quality in Mgbom Community, Afikpo North Local Government Area of Ebonyi State was done by Mbonu *et al.*, 2021. The purpose of the investigation was to appraise the quality of preferred public together with private borehole water utilized in various areas of the Mgbom Community, Afikpo North, of Ebonyi state, Nigeria. The samples of the water were collated from four dissimilar areas and acronym Samples A and B for the private boreholes, while Samples C and D are for public boreholes and



these samples were evaluated utilizing standard analytical methods. The results showed that at Temperatures of 29°C to 33°C the following were achieved: pH (6.12 – 7.02), Electrical Conductivity ($\mu\text{S}/\text{cm}$) (8.40 – 18.20), Turbidity (NTU) (10.56 – 28.60), DO (mg/l) (161.20 – 194.00), BOD (mg/l) (40.40 – 74.40), Total Alkalinity (mg/l) (18.67 – 32.00), Total Hardness (ppm) (40.00 – 126.67), TSS (mg/l) (346.67 – 406.67), TDS (mg/l) (140.00 – 533.33), Cadmium (ppm) (0 – 0.006), Lead (ppm) (0 – 0.048), and Iron (not detectable) for all the water samples analyzed.

The investigation of the quality of borehole water in the Nigeria Maritime University Kurutie Takeoff Campus and its environment was performed by [11]. The physiochemical analyses of the various samples considered are: pH of 8.1: 7.0; DO of 3.5mg/L:2.9mg/L; BOD₅ of 2.2mg/L:1.8mg/L; conductivity of 416 $\mu\text{S}/\text{cm}$: 340 $\mu\text{S}/\text{cm}$; TDS of 207mg/L: 170mg/L; nitrate of 0.3mg/L:23mg/L; turbidity of 2.0NTU:12NTU and hardness of 202.2mg/L: 121mg/L respectively.

Furthermore, in this study, the comparative analysis of different boreholes water qualities in Kurutie and Kunukunuma Communities in order to know which one is recommendable for drinking and which of them needs further treatment before usage.

II. MATERIALS AND METHODS

MATERIALS

Sample A is Borehole Water in Kurutie Community and Sample B is Borehole Water in Kunukunuma Community respectively, in Gbaramatu kingdom, Warri South West Local Government Area, Delta State. Samples are bottled in 100cl can preserved in a cool place before transported to the laboratory for physical, chemical and biological analysis. The equipment utilized to carry out the analysis are: BOD Bottles, Sample Bottles, Incubator, Dissolved Oxygen (DO) Meter, Pipettes, Microbiological Inoculum, Water Bath, pH Meter, pH Calibration Buffers, Buffer solution, Evaporating dish (100ml beaker) , Measuring cylinder (100ml) ,Hot plate, Drying oven Analytical balance, Glass filter or filter paper (Whatman 42) ,Desiccator, Conductivity Meter, Beaker, Deionized Water, Calibration Solutions, DO Meter, Thermometer, Stirring Rod, Winkler Reagents, Nitrate Test Kit or Nitrate Ion-Selective Electrode, Turbidimeter or Nephelometer , Titration Kit, Burette, EDTA Solution and Indicator Solution respectively.

METHODS

The different methods used are: BOD₅ - Biochemical Oxygen Demand (BOD₅) test in order to measure the level of organic pollution in the

water; pH - measures the acidity or alkalinity of water on a scale from 0 to 14 and the determination of hydrogen ion; TDS – measures the total concentration of inorganic and organic substances dissolved in water: It includes minerals, salts, metals, and other matter in the form of ions to ascertain the taste and water suitability for various uses; CONDUCTIVITY - a numerical expression of the ability of an aqueous solution to carry an electric current; DO- measures the concentration of oxygen dissolved in water and Low DO levels can indicate poor water quality and might impact aquatic organisms; NITRATE - is a form of nitrogen that can be found in water and high nitrate levels, often from agricultural runoff or wastewater, can pose health risks, particularly to infants; TURBIDITY - measures the cloudiness or haziness of water caused by suspended particles or solids, and HARDNESS refers to the concentration of dissolved minerals, primarily calcium and magnesium in water.

Experimentally, the Sample A and Sample B were taken to the laboratory to determine the different techniques enumerated and the results recorded and compared to WHO Standard whether the values are within the standard range (Ari, 2023; Otuora & Igoma, 2025)

III. RESULTS AND DISCUSSION

RESULTS

The results obtained after the experimental findings of the BOD₅, pH, TDS, conductivity, DO, Nitrate, Turbidity and Hardness of the Sample A and Sample B Boreholes water are recorded in **Table 1** respectively. **Table 2** entails the WHO Standard for water quality: the maximum value. Figure 1 is a bar chart for the comparable analysis of Sample A and Sample B Boreholes water respectively.

Table 1: Experiment's Recorded Results of Sample A and B

Parameters	Sample A	Sample B
pH	8.2	7.1
DO (mg/L)	3.6	3.0
BOD ₅ (mg/L)	2.3	1.9
Conductivity ($\mu\text{S}/\text{cm}$)	417.0	341.0
TDS(mg/L)	208.0	171.0
Nitrate(mg/L)	0.4	24.0
Turbidity (NTU)	3.0	13.0
Hardness(mg/L)	202.3	122.0



Table 2: WHO Standard for Water Quality

Parameters	Min Values	Max value
pH	6.5	8.5
DO (mg/L)	5.0	9.0
BOD ₅ (mg/L)	1.0	6.0
Conductivity	50.0	1500.0

($\mu\text{S}/\text{cm}$)		
TDS(mg/L)	500.0	1500.0
Nitrate(mg/L)	0.1	50.0
Turbidity (NTU)	5.0	25.0
Hardness(mg/L)	50.0	200.0

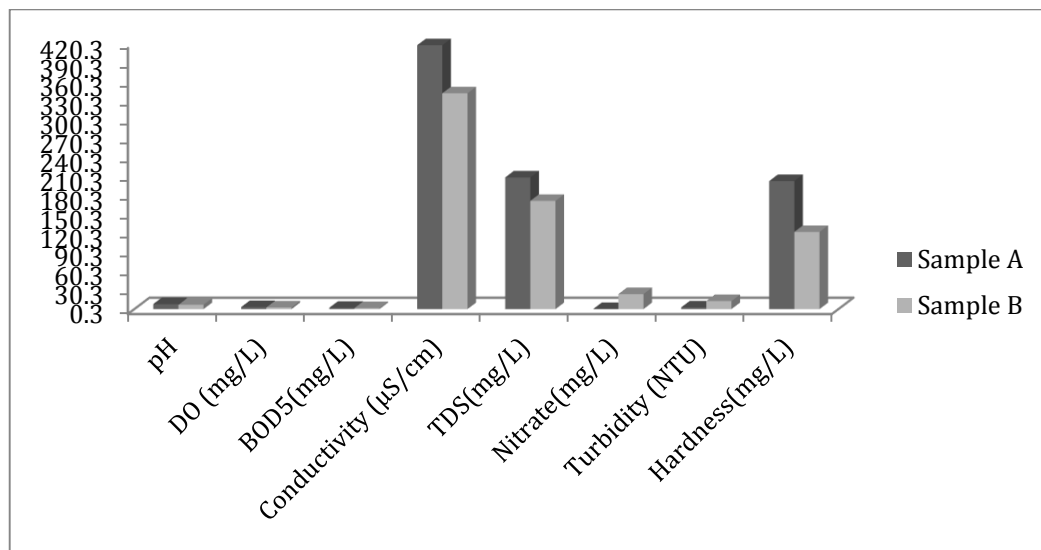


Figure 1: Bar Chart Comparing the Boreholes Water of Samples A and B parametric analyses

DISCUSSION

The results in Table 1 revealed a pH of 8.2, which confirms the total hardness in the Borehole water of Kurutie Community of sample A and a mild pH of 7.1 in the Kunukunuma Borehole water of sample B. The Kurutie Community Borehole hardness is the basement material that carbonate, bicarbonate or hydroxides extractions. The pH of 8.2 for Sample A and 7.1 for Sample B when compared to the WHO Standard as recorded in Table 2 proves to be within the range of 6.5 to 8.5. Meanwhile, the DO of Samples A and B is 3.6mg/L and 3.0mg/L respectively. The WHO Standard DO is 5.0mg/L to 9.0mg/L. Comparably, the DO of both samples A and B is low and this indicates that the two boreholes' water quality is poor. Also, sample A borehole water, which is the Kurutie borehole is better than Sample B because the DO of Sample A is higher than that of Sample B by 0.6mg/L. While the BOD₅ of the two boreholes water samples A and B are 2.3mg/L and 1.9mg/L and the WHO standard for BOD₅ ranges from 1.0mg/L to 6.0mg/L. The BOD₅ of the two water accessed show that borehole water of Kunukunuma community is clean from organic matters. The electrical conductivity of the

two Samples A and B is 417 $\mu\text{S}/\text{cm}$ and 341 $\mu\text{S}/\text{cm}$ comparable to the WHO standard of 50 – 1500 $\mu\text{S}/\text{cm}$ is OK. And it shows that the two borehole waters have the ability to conduct electricity and that the borehole water of Kunukunuma community is lower than that of Kurutie Community in terms of electricity conductivity. Precisely, the TDS are 208mg/L and 171mg/L for boreholes water of Kurutie and Kunukunuma communities respectively. If these values of TDS are compared to the WHO standard of 500 - 1500mg/L, it shows that it is below the WHO standard for drinking water. The nitrate content of the borehole waters of Samples A and B is 0.4mg/L and 24mg/L. Comparable to the WHO standard of 0.1 -50mg/L, it shows that it is within the standard for drinkable water without much health risk. The turbidity of water Samples A and B are 3NTU and 13NTU respectively. When compared to the WHO standard of 5 – 25NTU, it shows that it is within the standard of good water and its clarity is within the WHO standard. Furthermore, the hardness of the samples A and B water is 202.3mg/L and 122mg/L comparable to the WHO standard of between 50 – 200mg/L indicates



that the borehole water in Kurutie community has water hardness higher than the WHO standard and this can cause taste in the water. All these results discussed were compared to Ari, 2023; Oturo & Igoma, 2025) to see the correlation, and it tends to go to the same trend. Therefore, the need for treatment of the water, mostly the one of Kurutie Community, needs to be looked at.

IV. CONCLUSION

The comparative analyses of different borehole water qualities in Kurutie and Kunukunuma communities have been done. The two boreholes' water was bottled in two separate bottles of 100cl cans and labeled Sample A and Sample B, and they were preserved in a cool place before it was transported to the laboratory for physical, chemical and biological analysis. The laboratory experiments carried out are pH, BOD₅, TDS, DO, Nitrate, Turbidity and Hardness respectively. The results of the experiment show that the borehole water of Kurutie has pH – 8.2, DO – 3.6mg/L, BOD₅ – 2.3mg/L, Conductivity - 417 μ S/cm, TDS – 208mg/L, Nitrate – 0.4mg/L, Turbidity – 3.0NTU and water hardness of 202.3mg/L while that of the Kunukunuma borehole water contains pH – 7.1, DO – 3.0mg/L, BOD₅ – 1.9mg/L, Conductivity - 341 μ S/cm, TDS – 171mg/L, Nitrate – 24mg/L, Turbidity – 13NTU and water hardness of 122mg/L respectively. The results were compared to the WHO standard, and they are in agreement except for the water hardness of Kurutie Borehole water, which is about 2.3mg/L higher. It was recommended that water treatment should be done on Kurutie water to reduce the water hardness because other studies have also proved these results to be true.

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