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Physicochemical Properties Evaluation of Well and Borehole Water-Samples from *Elebu* District, Iddo LGA, Ibadan, Nigeria

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Abstract
Throughout ages, water has proven to be an indispensable liquid for life, food production, agriculture, domestic and industrial uses. Access to potable water in Nigeria poses a challenge due to infrastructural deficit. Well and boreholes remain major sources of potable water and in event of poor practices, the risk of contamination is imminent. Hence, continuous evaluation of water quality designated for specific purposes remains a necessity and is thus the underpinning of this study. A total of eleven (11) sites namely: *Eleta, Yidi, Akuru, Adedayo, Kuyoro, Elebu* market, *Ajokankan*, Health centre, Police station, Lawyer *Oke*, *Olanlege* streets, respectively were randomly selected from *Elebu* district. Ten samples each from well and borehole were collected and analyzed for physicochemical properties: pH, Conductivity (C); Total Dissolved Solids (TDS), Alkalinity, Salinity, hydrogen ion concentration (H^+), (pH) were determined in the laboratory using standard techniques. Salinity,

TDS and conductivity between January to March, 2024. Results revealed that pH of well and borehole water varied between 6.36±0.02 to 7.21±0.02 and 6.40± 0.01 to 7.10± 0.02 respectively and fell within WHO recommended limits of 6.4 to 8.5. Furthermore, the total hardness of well and borehole water ranged between 4.92±0.02 mg/L to 15.40± 0.10 mg/L and 7.84± 0.02 mg/L to 12.43 to 0.02 mg/L respectively and fell within World Health Organization (WHO) recommended limits of 0.0 to 180.0 mg/L. Iron (Fe) content of well and borehole water ranged between 1.21±0.21 mg/L to 3.17± 0.03 mg/L and 1.91± 0.03 mg/L to 3.84± 0.04 mg/L respectively which far exceeds WHO standards of 0.3 mg/L to 1.0 mg/L. Results from this study indicate that water from the wells and borehole in *Elebu* district of Ibadan is high in iron content load, hence there is need for water treatment procedure to engender safe water supply to the district.

Keywords: Water, Wells, Borehole, Elebu, Ibadan, Physicochemical properties
Word Count: 296

Introduction

Contamination of water sources available for household and drinking purposes by heavy elements, metal ions, and harmful microorganisms is one of the serious major health problems (Grant, and Dietrich, 2017). In fact, most minerals (particularly iron) from groundwater are absorbed by water. Although iron is an essential element in human nutrition; however, the health effects of iron in drinking water especially when excessive may result in fatigue and anemia (Getahun *et al*., 2014). Also, large amounts of iron in drinking water can give water an unpleasant metallic taste which may also alter the physico-chemical properties of such water. In addition, properly drilled boreholes and wells usually supply pure water at first, subsequently, if the water is not treated and the water tank washed, the population of microorganisms in the water increases, thus making it unsafe for drinking (Akpan-Idiok, *et al*., 2012). According to the World Health Organisation, in 2017, 5.3 billion people used improved water sources that were on-site, accessible when required, and free of contaminants. The remaining 2.2 billion individuals lacked access to secure, supervised services (WHO, 2010). Out of these 2.2 billion people, 1.4 billion had an enhanced water source located within a round trip of 30 minutes, whereas 206 million had restricted access to an improved water source that took more than 30 minutes to gather water. 435 million people drew water from unprotected wells and springs, while 144 million collected untreated surface water from lakes, ponds, rivers, and streams (WHO, 2017). Groundwater is typically considered safe to drink. However, its quality varies from place to location and it is sometimes determined by climate variations, soil types, surfaces, and the nature of the rocks through which the water flows. Human activities such as disposing of chemicals and microbiological material in landfills, burying them in the ground, or directly injecting waste into groundwater can alter the water's natural composition and quality (Kayode *et al*., 2019). Improper borehole construction may potentially lead to groundwater contamination. Agricultural operations, inappropriate solid waste management, and animal droppings near boreholes can all contaminate the water.

Problem Statement

Dug wells and boreholes are generally the main sources of water used for domestic purposes in many parts of Ibadan metropolis, since the failure of the State owned Water Cooperation Authority of Oyo State, in the mid 80’s (Brigid *et al*., 2020). Poor housing construction and layouts, couple with the fact that the nature of waste disposal affects the water quality in most parts of the city. This shortage of safe drinking water does not only pose threat to public health and well-being of the people, but also exposes a population of more than 2 million inhabitants of the city to water borne diseases as well as chemical intoxication, hence there is need for the investigation of most urban sprawl at the newly developing parts of the largest city south of Sahara.

Study Objective

The aim of this study is to determine the microbial profile and some physicochemical properties well and borehole water samples collected from Elebu district in Ibadan, Oyo State, Nigeria.

Materials and Methods

Study Area

Samples were collected from Elebu District, a suburb, located in Iddo Local Government, Area (LGA), Ibadan in Oyo-State, Nigeria. Elebu District which is located on latitude 7° 26' 39'' N and longitude 3° 54' 57'' E is one of the fastest growing communities in Iddo LGA (Igwemmar, *et al*, 2013). Although Elebu District is a relatively affluent district, it equally consist of shanties and some parts of it are still under-developed, hence it's a mixed world of interaction between elites, artisans as well as the less-privileged.

Physicochemical Analysis

Borehole and well water primarily constituted more than 90% of the water source to the inhabitants of the district, hence it is pertinent to take into cognizance the current physiochemical state of the two (2) main sources of water for the community dwellers. A total of 220 water samples (both borehole and well water) were randomly collected from eleven (11) selected streets with the study area. The selected streets were: *Eleta, Yidi, Akuru, Adedayo, Kuyoro, Elebu* market, *Ajokankan*, Health centre, Police station, Lawyer *Oke*, *Olanlege* streets, respectively (*see* Table 1). Sterile bottles were used to obtain the samples following a method described by Ngwa and Chrysanthus (2007) with slight modification. Before sampling, sample bottles were washed thoroughly with detergent, tap water, and then distilled water. In the case of well water, almost all the residence had a container tied and attached to their wells; water was drawn with these containers and poured into sample bottles, covered with a screw cap ensuring no air bubbles inside. Contrarily, water samples from borehole were collected from a tap outlet. Two samples each were collected from each sampling point. Physicochemical parameters determined were pH, Conductivity; Total Dissolved Solids (TDS), alkalinity and salinity respectively. The hydrogen ion concentration (pH) was determined in the laboratory using simple titration techniques. Salinity, TDS and conductivity were measured using EXtech meter Model ExStik Ec400. Transparency was measured using a secchi disc. Dissolved oxygen concentration was determined using the Azide modification of the Iodometric method as reported by Greenberg *et al* (1998). Alkalinity was measured with LaMotte Freshwater Aquaculture Test Kit Model AQ-2. The results were expressed as mg/L. Manganese (Mn) and Copper (Cu) were analysed using a Phillips Pye-unicamSp 9 atomic absorption spectrophotometer.

Data Analysis

Data collected in the course of this study were subjected to descriptive and inferential statistical analyses using percentages, descriptive statistics, mean and standard deviation (SD) with least significant difference. Inferences were drawn using Bi-serial correlation, t-test and a one-way ANOVA at $\alpha 0.05$.

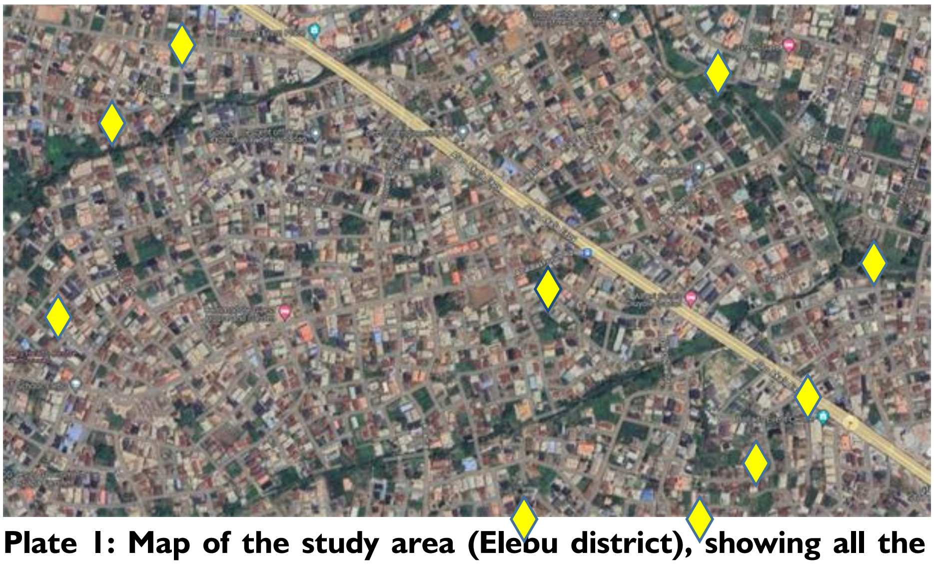

Plate 1: Map of the study area (Elebu district), showing all the sampling sites (the yellow dots indicates the sampling sites) Source: Google map, 2024.

Results

Table 1: List of samples collecting locations

Location Source of sample	BH sample points	WL sample points	Total samples
Eleta Street (ELS)	8	11	19
Yidi Street (YDS)	4	14	18
Akuru Street (AKS)	7	14	21
Adedayo Street (ADS)	6	11	17
Kuyoro Street (KYS)	9	13	22
Elebu Market Street (EMS)	5	12	17
Ajokankan Street (AJS)	3	9	12
Health centre Street (HCS)	8	10	18

Police station Street (PSS)	4	12	16
Lawyer-Oke Street (LOS)	8	2	10
Olanlege Street (ONS)	6	11	17
Total	68	119	187

NB: BH= Borehole water, WL= Well water

Source: Filed sample collection, 2024.

Table 2: Physio-Chemical Properties of Borehole Water in Elebu District.

Parameter	ELS	YDS	AKS	ADS	KYS	EMS	AJS	HCS	PSS	LOS	ONS	Mean
pH	7.30	7.45	7.52	7.00	6.83	6.91	7.30	7.45	7.52	7.00	6.83	7.23
E.C(μs/cm3)	129	142	184	154	140	137	129	142	184	154	140	151.50
TDS(Mg/l)	1.4	3.1	1.29	3.0	2.1	1.9	1.4	3.1	1.29	3.0	2.1	2.13
TSS(Mg/l)	0.03	0.05	0.04	0.07	0.30	0.02	0.03	0.05	0.04	0.07	0.30	0.09
Turb.(NTU	0.37	0.71	0.36	0.65	0.57	0.67	0.37	0.71	0.36	0.65	0.57	0.56
Total Hard.(Mg/l)	11.58	19.72	10.46	8.26	6.12	12.13	11.58	19.72	10.46	8.26	6.12	11.38
K Mg/l	3.11	3.62	3.03	3.06	3.01	4.86	3.11	3.62	3.03	3.06	3.01	3.45
Na Mg/l	4.54	3.42	3.20	5.00	6.30	3.86	4.54	3.42	3.20	5.00	6.30	4.39
Cl- Mg/l	1.03	0.83	16.86	6.21	10.22	13.72	1.03	0.83	16.86	6.21	10.22	8.15
Ca Mg/l	28.03	43.75	22.86	34.25	18.04	21.62	28.03	43.75	22.86	34.25	18.04	28.09
Mg Mg/l	10.83	10.76	11.62	12.23	11.35	10.07	10.83	10.76	11.62	12.23	11.35	11.14
Fe Mg/l	0.08	0.09	0.08	0.72	0.65	0.64	0.08	0.09	0.08	0.72	0.65	0.38
Si Mg/l	0.016	0.04	0.06	0.017	0.05	0.05	0.016	0.04	0.06	0.017	0.05	0.04
Zn Mg/l	0.029	0.021	0.034	0.023	0.039	0.041	0.029	0.021	0.034	0.023	0.039	0.03
Cr Mg/l	0.038	0.086	0.041	0.015	0.031	0.036	0.038	0.086	0.041	0.015	0.031	0.04
Cd Mg/l	0.005	0.009	0.009	0.008	0.001	0.002	0.005	0.009	0.009	0.008	0.001	0.006
Cu Mg/l	0.001	0.002	0.006	0.00	0.002	0.01	0.001	0.002	0.006	0.00	0.002	0.02
Mn Mg/l	0.009	0.006	0.004	0.002	0.002	0.005	0.009	0.006	0.004	0.002	0.002	0.05

Source: Filed sample collection, 2024

Table 3: Physio-Chemical Properties of Well Water in Elebu District

Parameter	ELS	YDS	AKS	ADS	KYS	EMS	AJS	HCS	PSS	LOS	ONS	Mean
pH	7.30	7.45	7.52	7.00	6.83	6.91	7.30	7.45	7.52	7.00	6.83	7.23
E.C(μs/cm3)	129	142	184	154	140	137	129	142	184	154	140	151.50
TDS(Mg/l)	1.4	3.1	1.29	3.0	2.1	1.9	1.4	3.1	1.29	3.0	2.1	2.13
TSS(Mg/l)	0.03	0.05	0.04	0.07	0.30	0.02	0.03	0.05	0.04	0.07	0.30	0.09
Turb.(NTU	0.37	0.71	0.36	0.65	0.57	0.67	0.37	0.71	0.36	0.65	0.57	0.56
Total Hard.(Mg/l)	11.58	19.72	10.46	8.26	6.12	12.13	11.58	19.72	10.46	8.26	6.12	11.38
K Mg/l	3.11	3.62	3.03	3.06	3.01	4.86	3.11	3.62	3.03	3.06	3.01	3.45
Na Mg/l	4.54	3.42	3.20	5.00	6.30	3.86	4.54	3.42	3.20	5.00	6.30	4.39
Cl- Mg/l	1.03	0.83	16.86	6.21	10.22	13.72	1.03	0.83	16.86	6.21	10.22	8.15
Ca Mg/l	28.03	43.75	22.86	34.25	18.04	21.62	28.03	43.75	22.86	34.25	18.04	28.09
Mg Mg/l	10.83	10.76	11.62	12.23	11.35	10.07	10.83	10.76	11.62	12.23	11.35	11.14
Fe Mg/l	0.08	0.09	0.08	0.72	0.65	0.64	0.08	0.09	0.08	0.72	0.65	0.38
Si Mg/l	0.016	0.04	0.06	0.017	0.05	0.05	0.016	0.04	0.06	0.017	0.05	0.04
Zn Mg/l	0.029	0.021	0.034	0.023	0.039	0.041	0.029	0.021	0.034	0.023	0.039	0.03
Cr Mg/l	0.038	0.086	0.041	0.015	0.031	0.036	0.038	0.086	0.041	0.015	0.031	0.04
Cd Mg/l	0.005	0.009	0.009	0.008	0.001	0.002	0.005	0.009	0.009	0.008	0.001	0.006
Cu Mg/l	0.001	0.002	0.006	0.00	0.002	0.01	0.001	0.002	0.006	0.00	0.002	0.02
Mn Mg/l	0.009	0.006	0.004	0.002	0.002	0.005	0.009	0.006	0.004	0.002	0.002	0.05

Source: Filed sample collection, 2024.

Table 4: The Mean Standard Error and Range of Physicochemical Parameters of water samples collected from Elebu district

Parameters	Mean ± S.E	Range
Alkalinity (mg CaCO3/L)	1.26±0.4230	0.8-1.90
Conductivity (μmhos/cm)	347.53±36.90	290.65-391.7
Total dissolved solid (mg/L)	156.56±5.61	143.7-157.5
Salinity (ppt)	0.10±0.0001	0.11-0.18
pH	7.97±0.390	7.3-8.5
Transparency (m)	2.70±0.659	0.2-0.5

Source: Filed sample collection, 2024.

Plate 2: One of the sample collection point (Yidi Street) in Elebu district in Ibadan.
Source: Filed sample collection, 2024.

Table 5: Correlation co-efficient (r) matrix for the physico-chemical parameters during the study period.

	DO	Alkalinity	Conductivity	TDS	pH	Water	Transparency
DO							
Alkalinity	0.859						
Conductivity	-0.081	0.138					
TDS	0.805	0.819	-0.278				
pH	-0.283	-0.093	0.916	-0.536			
Water	-0.757	-0.738	0.556	-0.912	0.748		
Transparency	-0.441	-0.495	0.269	-0.731	0.453	0.614*	

Source: Filed sample collection, 2024.

Table 5: Suitability of Water Samples from the study area.

Parameter	ELS	YDS	AKS	ADS	KYS	EMS	AJS	HCS	PSS	LOS	ONS	Mear
Borehole	0.30	0.45	0.52	0.00	0.83	0.91	0.30	0.45	0.52	0.00	0.83	0.23
Well	0.03	0.83	0.86	0.21	0.22	0.72	0.03	0.83	0.86	0.21	0.22	0.15
Dispersion	0.58	0.72	0.46	0.26	0.12	0.13	0.58	0.72	0.46	0.26	0.12	0.38

Source: Field sample collection, 2024.

Plate 3: One of the sample collection point (Health Centre Street) in Elebu district in Ibadan.
Source: Filed sample collection, 2024.

Plate 4: One of the sample collection point (Eleta Street) in Elebu district in Ibadan.
Source: Filed sample collection, 2024.

Plate 5: One of the sampled wells in Elebu District in Ibadan.
Source: *Filed sample collection, 2024*

Plate 6: One of the sample boreholes in Elebu district in Ibadan
Source: *Filed sample collection, 2024*.

Discussion

Hydrogen ions (pH) - The pH of borehole water in the research region varied from 6.83 to 7.45, with a mean of 7.23, as compared to the well-water samples, respectively. The results show that the water samples were slightly acidic (6.83) to slightly alkaline (7.45). The range indicates that pH concentrations are consistent across samples. Adeshina *et al*. (2011) revealed that the pH of the Ona River, a nearby stream to the study (Elebu, Ibadan, Nigeria), was consistent. The electrical conductivity (EC) of water samples varied from 129-184μs/cm3, with a mean value of 151.50μs/cm3. The range demonstrates a wide variability of electrical conductivity in water samples during the dry season. In a similar study, Getahun e*t al*. (2014) reported a larger range of EC (100–730 µS cm-1) in the district of Ibadan Northwest LGA, wherein the closest range of 122-154μs/cm3 is somewhat low because excellent quality water for home consumption should have an EC of 1500 μs/cm3 or more found in the said area. This corroborates the assertion of WHO, (2010), regarding the constituents of water resources in Ibadan, metropolis.

Total Dissolved Solids (TDS) – The concentration of TDS in water samples varied from 1.4 to 3.1 Mg/l, with a mean of 2.13 Mg/l. The range represents a wide variability of TDS in borehole water in the research region. Okoro *et al*. (2017), found a range of 41.4-227.2mg/l for three borehole water sources in Ibadan metropolitan area, Oyo State, Nigeria, however this is more uniform. The total suspended solids (TSS) in well-water samples varied from 0.02-0.07Mg/l, with a mean value of 0.09Mg/l compared to the bore-hole samples. The range reflects homogeneity in the concentration of TSS in water in the study's borehole. Total suspended solids are critical in assessing water quality; according to Shalom *et al*. (2011), high concentrations of suspended particles can cause a variety of difficulties for water utilization. A high TSS in a water body can frequently indicate increased concentrations of germs, bacteria, nutrients, pesticides, and metals in the water, making it dangerous to consume. Turbidity varied from 0.36-71NTU, with an average value of 0.56NTU. The range represents a wide dispersion of turbidity in water in the research area's borehole, as compared to the well water samples obtained. Turbidity is a measure of how much water loses clarity owing to suspended particles (WHO, 2012). Well-water with high turbidity has both an aesthetic and a health effect. Thus, it is critical to remove turbidity from water in order to adequately disinfect it for drinking reasons.

Total Hardness - The concentration of total hardness in water in the borehole studied ranged from 6.1219.72Mg/l to 11.38Mg/l, as compared to the well-water samples. The range represents a wide variability of total hardness in water. Total hardness concentrations in water samples are lower than those reported by APHA (2005) but higher than those reported by Akpan-Idiok, *et al*. (2012). APHA (2005) observed a range of 29-94 Mg/l, whereas Akpan-Idiok recorded a range of 6.41-19.20 Mg/l.

Mineral Nutrients (K, Na, Cl-, Mg, Ca) - Except for Chloride, Magnesium, and Calcium, mineral nutrient concentrations in Borehole samples, in the research region are rather low. Concentrations were as follows: Potassium (K) concentrations varied from 3.03 to 4.84 Mg/l, with a mean of 3.45 Mg/l. Sodium (Na) levels varied from 3.206.30Mg/l to 4.39Mg/l on average. Chloride (Cl-) concentrations varied from 1.03 to 16.86 Mg/l, with an average of 8.15 Mg/l. Magnesium (Mg) concentrations varied from 10.07 to 12.23 Mg/l, with a mean of 11.14 Mg/l. Calcium (Ca) concentrations varied from 18.04 to 43.75 Mg/l, with a mean of 28.09 Mg/l. Mineral nutrient concentrations (potassium (K), sodium (Na), chloride (Cl-), magnesium (Mg), and calcium (Ca) are in the sequence Ca> Mg> Cl->Na>K. Heavy metal concentrations (Iron Fe, Zinc Zn, Lead Pb, Chromium Cr, Cadmium Cd, Copper Cu, Manganese Mn) Cadmium Cd, Copper Cu, and Manganese Mn are as follows:

Iron (Fe) concentrations varied from 0.08 to 0.72 Mg/l, with a mean of 0.38 Mg/l. Zinc (Zn) concentrations varied from 0.021 to 0.051Mg/l, with an average of 0.03Mg/l. Chromium (Cr) concentrations varied from 0.016 to 0.086 Mg/l, with a mean of 0.04 Mg/l. Cadmium (Cd) concentrations varied from 0.001-0.009 Mg/l, with a mean of 0.01 Mg/l. Lead was not found. Copper (Cu) concentrations varied from 0.00 to 0.006 Mg/l, with a mean of 0.002 Mg/l. Manganese (Mn) levels varied from 0.0020 to 0.009Mg/l, with a mean value of 0.005Mg/l. The amounts of heavy metals in the samples are comparatively lower than the results of Sabo *et al*. (2020), who reported the following: Lead (0.01mg/l), Zinc (0.91mg/l), Iron (0.6mg/l), Manganese (0.29mg/l), and Chromium (0.05mg/l) were found in borehole fluids in Oluyole Extension's industrial zones. This was linked to decreased industrial activity in the Elebu District. However, incorrect management was shown to be the cause of the prevalence of heavy metals such as Cr, Cd, and Cu in the research region.

Suitability of the Borehole Water for Drinking Purpose

The suitability of water samples for drinking purpose was ascertained by comparing the water properties with the WHO standard for drinking purpose (WHO, 2010)(see Table 5). Also, Table 2 illustrates the concentrations of borehole water's physical and chemical qualities, as well as the NSDWQ and WHO drinking standards. It demonstrates water qualities and regulatory norms as follows: pH varied from 6.83 to 7.45. This number falls between the 6.5-8.5 NSDWQ range and the 6.5-9.2 WHO domestic norm. Thus, borehole water in the Elebu District is safe for residential use in terms of pH.

Electrical Conductivity

The E.C of borehole water in Elebu District varied from 129-184 μS/cm3 with a mean value of 151.50 μS/cm, which is below the ≥ 1000 μS/cm3 NSDWQ and ≥1500 μS/cm3 WHO guidelines for residential use (WHO, 2010). Thus, the EC of borehole water in the Elebu District falls short of regulatory requirements. As a result, water from boreholes in the Elebu District is not safe to consume according to EC. Igwemmar *et al.* (2013) similarly found E.C. levels below the World Health Standard in four boreholes within a distance of 5*km* way from the study site.

Total Dissolved Solids, Turbidity and Hardness Drinking purpose. TDS levels varied from 1.43.1 mg/l. As a result, all readings fall below the WHO's (2010) limit of 500 Mg/l. Turbidity levels were below WHO's recommended limits of ≤5NTU for drinking and ≤10NTU for NSDWQ, ranging from 0.36-0.71NTU. As a result, all borehole water samples are safe to consume due to their turbidity. T. Hardness also met regulatory norms, ranging from 6.12 to 19.72 mg/l, with NSDWQ and WHO limits of 500 mg/l and 200 mg/l, respectively.

Mineral Nutrients (K, Na, Cl, Mg and Ca)

The concentrations of these minerals K, Na, Cl, Mg, and Ca were frequently lower than the regulation level. Potassium (K) concentrations varied from 3.03 to 4.84mg/l, whereas the WHO limit for household use is l00mg/l. Sodium (Na) levels varied from 3.20 to 6.30mg/l, whereas the WHO limit for home use is 60mg/l, and the national standard is 200mg/l. Chloride levels varied from 1.03 to 16.86mg/l, whereas NSDWQ is 250mg/l. Calcium (Ca) levels varied from 18.0443.75mg/l, although the WHO minimum for household purposes is 75mg/l. Magnesium (Mg) levels varied from 10.07 to 12.23mg/l, although the WHO norm for household purposes is 30mg/l.

Heavy metals (Fe, Si, Zn, Pb, Cr, Cd, Cu, and Mn).

Heavy metal concentrations were typically modest, however several samples did not meet regulatory criteria for drinking water. The concentration of iron (Fe) in the samples exceeded the WHO threshold of 0.1Mg/l, ranging from 0.08-0.72\mg/l. Zinc (Zn) values were usually lower than the WHO norm of 5 Mg/l, ranging from 0.031 to 0.061 Mg/l. Chromium levels varied between 0.006-0.008 mg/l, which is under the WHO's drinking water standard of 0.05 mg/l. Cadmium concentrations of 0.001-0.009mg/l are lower than the WHO's drinking water standard of 0.05mg/l. Pb was not discovered in all the tests, therefore borehole water in Elebu district, Ibadan is safe to drink in terms of lead. Copper levels varied from 0.00 to 0.06 mg/l, while the WHO limit for home use is 0.05 mg/l, hence the sample(s) fell short of the WHO criterion for drinking water. Manganese (Mn) levels varied from 0.02-0.09 mg/l, meeting the WHO domestic limit of 0.5 mg/l.

Conclusion

Majority of borehole water samples were found to be acceptable for drinking; nevertheless, well water samples did not meet the drinking water safety criteria in terms of E.C. or Fe. This study equally concluded that well and borehole water in Elebu district is less hard and some dissolved ions and Total Dissolved Solids (TDS.) It is also vital to identify the sources of possible impurities (TDS), which can be attributed to soil types, industrialisation, water chemistry, and other human activities, especially with indiscriminate waste disposal. The results suggested that the water samples were slightly acidic (6.83) to slightly alkaline (7.45). E.C. was modest, ranging from 129-184 μS/cm3. The metals Fe, Mn, Zn, Al, Pb, Cd, and Cu are all within acceptable limits for drinking water, suggesting high quality. All samples (both borehole and well water contained acceptable levels of heavy metals, with the exception of Fe. *Eleta, Yidi, Akuru, Adedayo, Kuyoro, Elebu* market, *Ajokankan*, Health centre, Police station, Lawyer *Oke*, *Olanlege* streets samples, met drinking-water regulation criteria.

Recommendations

More studies are essentially requiredto provide a more comprehensive physicochemical survey of the study area. In addition, domestic and household water treatment, such as flocculation, coagulation, decantation, filtration, and chlorination, could be required to eradicate the TDS present in the obtained water samples, before consumption. On a general note, it is consequently advised that well water from these placesbe treated before to consumption.

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