DETERMINATION OF PHYSIOCHEMICAL PROPERTIES OF WELL WATER IN OZORO, ISOKO NORTH LOCAL GOVERNMENT AREA OF DELTA STATE

INTRODUCTION

Water has always been a subject of great interest to man since it is essential for human survival. The rural people have less access to good quality water and rely on the available ground water sources and also use local purification methods to get clean drinking water in order to prevent health problems (waziri et al., 2012). The quality of drinking water is a powerful determination of health. Assurance of drinking water safety is a foundation for the prevention and control of water borne diseases (Onojah et al., 2013).

Water is one of the essentials that support all forms of life (Vanloon and Duffy., 2005). Contaminations of water have been a major source of health problems particularly in the developing countries (UL-Haq et al., 2011). Water is essential to health; however its purity, portability and the mineral content is important for consumption by humans (Kawther and Alwakeel, 2009). The chemical quality of drinking water during recent years have deteriorated considerably due to the presence of toxic elements, which even in trace amounts can cause serious health hazards (Ikem et al., 2002). Ground water (bore holes and wells) serves in Ozoro as major sources for drinking. Nearly 90% of diarrhea related cases and death have been attributed to unsafe water supply and poor sanitation condition (WHO, 2006).

Heavy metals refer to metals with density greater than 5.g/cm3 and atomic number greater than 20 (Rault et al., 2012), and they are toxic chemicals. Water may contain toxic metals like mercury, lead, cadmium, arsenic and selenium. Those metals can cause acute or chronic poisoning and should be eliminated from drinking water if possible (onojah et al., 2013). Heavy metals are one of the most persistent pollutants in water. Unlike other pollutants, they are difficult to degrade and can accumulate producing potential human risks and ecological disturbances (Shri SK Sahni., 2011). Heavy metals occurrence and accumulation in the

environment is as a result of direct or indirect human activities such as rapid industrialization, urbanization and anthropogenic sources (Martin-Gonzalez et al., 2006). Water should be free from any form of contamination, it is therefore important to determine the levels of minerals, heavy metals and also microbiological content of drinking water. The objective of this study is to determine some of the physiochemical parameter of well water consumed in Ozoro, Isoko North local government area of Delta state, Nigeria.

MATERIALS AND METHODS

Location of research: this study was conducted in Ozoro town the head quarter of isoko north local government area, one of the two administrative units in isoko region of delta state, southern Nigeria. Ozoro town is one of the largest communities in isoko land both in land mass and population. It lies between longitude $6^{o}12^{1}58^{11}$ E and latitude $5^{o}3^{1}18^{11}$N (www.wikipedia.org).

SAMPLE COLLECTION AND ANALYTICAL PROCEDURE:

Ten well water samples were collected at different locations in Ozoro town in Isoko north local government area of Delta state, Nigeria. The different water samples were collected into sterilized bottles and labeled S1, S2, S3 to S10 (Karikari and Ansa – Asare, 2006). All the samples were kept at room temperature (25 – 30°C) and analysis carried out after 24 h of collection of samples (Amajor et al., 2012).

MINERAL AND HEAVY METAL ANALYSES

The samples were analyzed for minerals using trimetric methods in accordance with the standard method of analysis of water samples (AOAC, 2000).
A Complete digestion of the raw well water samples was done with nitric acid in a fume chamber. Metals in water samples were extracted and analyzed in accordance with the standard method of analysis of water samples (AOAC, 2002). Concentration of lead, copper, zinc and iron was determined in each of the water samples using a U-V Spectrophotometer Model 752N at different wavelengths for each heavy metal determination.

Statistical Analysis

Data were expressed as the mean of triplicates ± SEM. Means were analyzed using a one-way analysis of variance (ANOVA). All the statistical analyses were done using SPSS, Version 16.0.

RESULTS AND DISCUSSION

Table 1: Physical properties Test Result

SN	SAMPLES	PH	TASTE	ODOUR	CONDUCTIVITY (ppm)	TDS (mg/L)
1	**S1**	6.8	Tasteless	Musty	0.2	0.97
2	**S2**	6.9	Tasteless	Odorless	0.4	0.77
3	**S3**	7.1	Tasteless	Odorless	0.3	1.32
4	**S4**	6.6	Tasteless	Chlorine odor	0.5	1.70
5	**S5**	6.7	Salty	Odorless	0.1	0.47
6	**S6**	6.9	Tasteless	Odorless	0.3	1.64
7	**S7**	7.0	Tasteless	Odorless	0.1	0.53
8	**S8**	7.0	Tasteless	Odorless	0.3	1.63
9	**S9**	6.9	Tasteless	Chlorine odor	0.3	1.15
10	**S10**	6.9	Tasteless	Earthy	0.4	1.51

The organoleptic characteristics (odour and taste) were determined by physical observation through sensory organs. The pH of the different water samples were determined using Hanna microprocessor pH meter. A conductivity meter (model Jenway, 4010) was used to determine the conductivity of the different well water. The total dissolved solids (TDS) were estimated by gravimetric method. Total hardness was determined using titration method, the well water were titrated with EDTA using eriochrome black T indicator until colour change from purple-red to blue.

The pH values of the different samples were shown in Table 1. The highest pH value of 7.1 was measured in sample 3, and the lowest pH value of 6.6 was measured in sample 4. The results obtained were within the standard range of 6.5 to 8.5 required for drinking water according to W.H.O and the Nigeria standard. 9 (nine) water samples were tasteless except for sample 5 that has a salty taste which

can be an indication of the presence of some impurities in the well (Patil et al., 2012). Sample 1 and sample 10 has a musty and earthy odour respectively which can be as a result of the well not having concrete ring beneath it, and presence of dust inside the well.

The conductivity was estimated between 0.1 and 0.4 ppm. All values were found below the maximum permissible limit of WHO standard. The total dissolved solid ranged from 0.47 to 1.70 and falls within the permissible limit recommended by WHO(500mg/L).

Table 2: Minerals and Heavy Metals Results

SN	SAMPLES	Ca (mg\l)	Cl- (mg\l)	Mg (mg\l)	Cu (mg/l)	Pb (mg/l)	Zn (mg/l)	Fe (mg/l)
1	**S1**	0.03±0.06	0.04±0.00	0.06±0.01	0.03±0.02	0.00±0.01	0.04±0.03	0.07±0.02
2	**S2**	0.07±0.04	0.01±0.03	0.09±0.01	0.02±0.01	0.01±0.00	0.02±0.02	0.05±0.01
3	**S3**	0.10±0.00	0.00±0.01	0.04±0.01	0.03±0.01	0.01±0.01	0.04±0.01	0.03±0.05
4	**S4**	0.09±0.02	1.03±0.06	0.03±0.01	0.05±0.02	0.01±0.00	0.06±0.02	0.10±0.02
5	**S5**	0.12±0.01	0.08±0.02	0.11±0.01	0.05±0.00	0.02±0.01	0.03±0.02	0.06±0.03
6	**S6**	0.00±0.05	0.04±0.02	0.09±0.02	0.04±0.01	0.00±0.01	0.01±0.03	0.02±0.04
7	**S7**	0.01±0.02	0.00±0.06	0.01±0.01	0.02±0.00	0.00±0.00	0.01±0.02	0.00±0.01
8	**S8**	0.03±0.01	0.01±0.01	0.01±0.00	0.00±0.01	0.00±0.00	0.02±0.02	0.01±0.02
9	**S9**	0.09±0.03	1.02±0.04	0.08±0.00	0.05±0.01	0.02±0.01	0.06±0.01	0.03±0.00
10	**S10**	0.10±0.02	0.05±0.01	0.02±0.02	0.06±0.01	0.02±0.00	0.03±0.06	0.09±0.01

Ca= Calcium; Cl=chloride; Mg = Magnesium; Cu = Copper; Pb = Lead; Zn= zinc, Fe= iron. *WHO (2008) Guidelines.

This study showed the presence of low concentrations of minerals and heavy metals in the different well water samples. All the water samples had concentrations <0.001 mg/l for Ca, Cl, Mg, Cu, Pb, Zn and Fe which was below the maximum acceptable concentration (MAC) set by World Health Organization (WHO, 2008). The concentration of calcium and magnesium in the water sample 5 was higher than that of the other samples mineral content and heavy metals, though still below the MAC. The high chlorine content in sample 4 and 9 could be as a result of domestic contamination by dwellers in the area.

The Cu level for the well water sample ranged from 0.00±0.001 to 0.06±0.01and fell within the maximum permissible limit by WHO (2.00). Pb content in sample 5, 9 and 10 was high (0.002mg/L) compared to other samples and it exceed the WHO guideline (0.01mg/L) but within that of USEPA (1.00).
Zn level ranged from 0.01±0.02 to 0.06±0.01 and all were within the permissible range of WHO (3.00). The Fe level of all water samples range from 0.00±0.001 to

0.10±0.02mg/L and are within the maximum concentration by WHO (3.00). sample 7 was completely free from Fe.

CONCLUSION

This study determined the minerals and heavy metals contents of different well water in Ozoro town. The heavy metal levels were very low when compared with WHO guidelines for the maximum acceptable concentrations.

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