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Evaluation of the Ph, Iron and Lead Levels of the Functional Boreholes in Federal Government College, Warri, Delta, Nigeria

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ABSTRACT
The pH, Iron and Lead levels in borehole water collected randomly from some selected borehole drinking water in Federal Government College (F.G.C) Warri, Delta State, Nigeria was analysed. It was compared with NAFDAC, WHO and NSDWQ standards for safe drinking water. Experimental research design was used to collect and analyze five samples of untreated borehole drinking water all in Federal Government College, Warri. pH was determined by Winlab Model 290A pH meter, iron and lead by Atomic Absorption Spectrometer (AAS) and addition of 5.0ml of concentrated HNO_3. The result of the findings were compared with that of NAFDAC, WHO and NSDWQ recommended standard for safe drinking water which showed that all the samples of borehole waters are safe for consumption
Keywords: pH, Iron, Lead, borehole, drinking water.

Introduction

The Importance of water to man and his environment cannot be overemphasized. It is the duty of the government to protect the health of her citizens. In Nigeria the National Agency for Food and Drug administration and Control (NAFDAC), a parastatal of the Federal Ministry of Health has been saddled with the responsibility of making sure that the citizens of this country have well purified water; be it sachet, bottled or borehole water. Government-owned public water utilities, such as Water Corporations, are statutorily charged with the responsibility of supplying water from conventional water treatment plants that use water from impounded reservoir (dams) flowing streams, lakes and deep boreholes. As the country population grew and industries increased, the supply of water by the public utilities became inadequate in quality and quantity. This led to the emergence, and proliferation of private water enterprises that operated side by side with the government-owned public water utilities and individuals who could afford the cost sinking their own borehole.

Aderibigbe*et al.* (2008); Adamu (2009), Maconachie (2008) and Gbadegesin and Olorunfemi (2007), have observed the inadequacy of the country's water supply compared with the increase in population. Machonachie(2008) and Adamu(2009) provide evidence of this shortage of water in Kano and Kaduna respectively through their state-specific evidence in terms of quality. Gbadegesin and Olorunfemi (2007) lamented that "after almost sixty years of water supply in Nigeria, it is regrettable that only 60 percent of the population have access to safe drinking water, and in rural area less than 50 percent of the households have access to good potable water". Akunyili (2003) stated that the inability of the Government to persistently provide adequate potable water for the growing population has tremendously contributed to the proliferation of 'pure water' producers in Nigeria. Thus, the quest for solutions to the dearth of potable water led to the production of sachet water by some opportunistic private individuals who thought they could make profit by packaging and selling water to the needy. The private water enterprises mainly collect their water as the end-product of initially treated water supplied by the government-owned public utilities and do little treatment such as the removal of the suspended solids to make the government-produced water more potable. They also do some minor treatment on water from natural springs, open wells and boreholes.

The provision of water that is not only safe, but tasteless, odourless and clean in appearance is top priority in any country that cares for good health (Akunyili 2003). The private individuals purportedly treat not-fit-for-drinking water, like well, borehole, and make them fit for drinking while consumers cannot by themselves ascertain the quality of drinking water. Naturally, water that appears milky, discoloured, smelly or with unpleasant taste would be treated by these opportunists but not with grave suspicion from the consumers.

Increase in human population has exerted an enormous pressure on the provision of safe drinking water especially in developing countries such as Nigeria vis-à-vis Warri metropolis. Federal Government College, when it was established had a few population of staff and students. Currently the population has increased, causing some staff to sink their own personal borehole in the staff quarters and the school sinking other boreholes in both the boy's hostel and the girl's hostel to cope with the water need of the increased population since the old borehole is always breaking down.

Borehole water which is water trapped beneath the ground known as ground water is usually clear and does not require filtration. Nevertheless, there is the problem of pH, Lead and Iron in some borehole water. This study was to ascertain the degree of the portability of water from the functional boreholes in Federal Government College, Warri and to know if they conformed to the WHO, NAFDAC and *NSDWQ* standards.

MATERIALS AND METHODS:

Research Design: This research was designed at the Delta State University, Abraka, while the analysis was carried out at the College of Education, Warri in collaboration with TUDAKA Environmental Consultants limited. The site of sample collection comprises of the boy's hostel, the girl's hostel, the general borehole drinking water used by staff, flat C29 Senior Staff Quarters (SSQ) and flat C30 Senior Staff Quarters.

Collection of samples: Fresh untreated borehole drinking water samples were collected randomly at designated areas in FGC, Warri using plastic containers. The containers were then sealed and labelled BH A, BH B, BH C, BH D and BH E before they were taken to the laboratory for analysis. A total of five samples of borehole water were collected to represent all the boreholes water in Federal Government College, Warri. The samples were analysed within 24 hours of collection at the laboratory of the TUDAKA Environmental Consultants limited.

Assay: pH was determined by Winlab Model 290A pH meter, iron and lead was determined using the wet oxidation method after which it was analysed using Atomic Absorption Spectrometer (AAS).

RESULTS AND DISCUSSION:

The provision of an adequate supply of safe drinking water was one of the eight components of Primary Health Care identified by the International conference on primary health care in 1978 by the World Health Organization (WHO). In Nigeria government-owned public water utilities, such as Water Corporations, are statutorily charged, with the responsibility of supplying water from conventional water treatment plants that use water from, impounded reservoir (dams) flowing streams, lakes and deep boreholes
The result of the samples analysis of pH, Iron (mg/l) and lead (mg/l) levels are presented below:

Table 1: Concentration of the parameters in the five samples of borehole drinking water.

Parameters	BH A	BH B	BH C	BH D	BH E
pH	6.97	6.78	6.66	7.23	6.98
Fe^{2+} (mg/l)	0.011	0.013	0.016	0.012	0.010
Pb (mg/l)	<BDL	<BDL	<BDL	<BDL	<BDL

Table 2: Comparism of the parameters in the five samples of borehole drinking water with that of WHO, NAFDAC and NSDWQ.

Parameters	BH A	BH B	BH C	BH D	BH E	WHO	NAFDAC	NSDWQ
pH	6.97	6.78	6.66	7.23	6.98	6.50-8.00	6.50-8.00	6.50-8.00
Fe^{2+} (mg/l)	0.011	0.013	0.016	0.012	0.010	0.3	0.05-0.3	0.3
Pb (mg/l)	<BDL	<BDL	<BDL	<BDL	<BDL	0.05	0.01	0.01

The results from this study revealed that the pH range is between 6.66 -7.23 and pH of sample D is higher than the rest but falls within the NAFDAC, WHO and NSDWQ acceptable standard limit for portable drinking water. It therefore did not exceed the maximum acceptable limit of 8.50 NAFDAC and NSDWQ.

The iron level of borehole water that was analysed, fell within the accepted standard for portable drinking water and as such the water is fit for consumption. It therefore means that the water is equally fit for consumption since it falls within the accepted standard (Table 1)..

The result also showed that the lead level is <0.001 for both the borehole water in staff quarters and students' hostels. Therefore the water is lead free and fit for consumption.

In summary, the result from the test analysis on samples for pH, iron and lead for both the staff quarters and students' hostels are within the NAFDAC, WHO and NSDWQ maximum limit (6.50-8.50) and (0.05-0.30) respectively for pH and iron.

Conclusion

The findings indicated that the samples of borehole water are safe for consumption by staff and students of Federal Government College, Warri with respect to pH, iron and lead as they are within and below the NAFDAC, WHO and NSDWQ recommended standard for safe drinking water. However, sample A to E recorded no level of lead in the boreholes and makes it very safe for consumption by staff and students.

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