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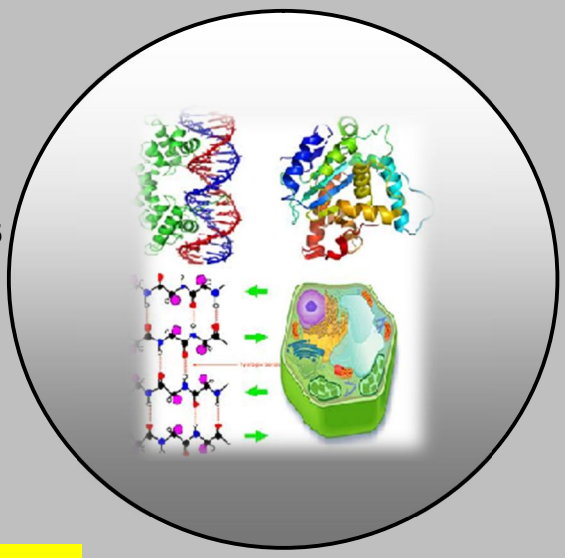

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RESEARCH PAPER

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Assessment of Cadmium, Lead and Iron in Hand Dug Wells of Aiyetoro, South-Western Nigeria

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ABSTRACT

Access to quality drinking water is a great problem to most developing countries of the world. This paper is focused on groundwater quality assessment in Aiyetoro area south western Nigeria. Cadmium, Lead and Iron in hand dug wells were assessed following standard procedures of analyses. The Mean ± S.D of the results obtained were Cadmium 0.017±0.016 mg/l; Lead 0.229±0.061 mg/l; Iron 1.076±2.393 mg/l. It was observed that all the parameters were higher than the standard limits specified for drinking water by WHO except for iron which was generally lower compared to the standard. Hence, the well water in the study location is unsuitable for drinking.
Keywords: Aiyetoro, Metal, Water quality, Contaminants and Pollution.

INTRODUCTION

Adequate water resources for future generations are not only a regional issue but also a global concern. Global environment now consists of numerous natural and artificial metals. Metals have played a critical role in industrial development and technological advances. Most metals are not destroyed; indeed, they are accumulating at an accelerated pace, due to the ever-growing demands of modern society (Mendi, 2005). Quality drinking water is essential for life. Unfortunately, in many developing countries of the world, including Nigeria, good, portable and hygienic water has become a scarce commodity (IDLO, 2006) as only a small proportion of the populace has access to treated water.

Hence, there is indiscriminate use of rainwater and ground water source for drinking and other domestic usage in most communities in the study area without prior knowledge of the quality of such water. These as led to health risks which is synonymous with the study area. Therefore, it becomes so important and necessary to investigate whether the levels of these inorganic contaminants (Cd, Pb and Fe) in hand dug wells in Aiyetoro are sufficient to affect the health of the inhabitants of the areas under investigation.

STUDY AREA

Aiyetoro is among the major towns in Ogun state, Southwestern Nigeria (figure 1). Aiyetoro town is about 35 km Northwest Abeokuta, Ogun State and about 100 km from Ikeja, the capital city of Lagos State. Aiyetoro is situated in a flat and sloppy terrain in deciduous-derived savannah zone of Ogun State. The climate is sub-humid tropical with a longtime average annual rainfall of 1,350mm. The landform is that of eroded pediment plain with well-incised valleys forming a trellis pattern. The soils are developed over a deeply weathered layer of sedimentary rocks consisting of false bedded sandstones which underlies the area. The sediments are of lower cretaceous rocks or Abeokuta form.

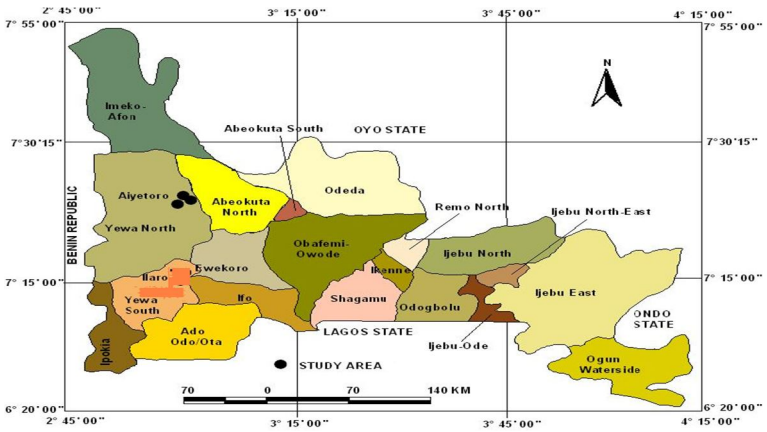

Figure 1. Map of Ogun State showing the Study Area.

MATERIAL AND METHODS

Water samples were randomly collected from the study area at 10 sampling points; Yidi road, Idagba, Oke-Oyinbo, Idofoyi, Saala, Ilupeju, Eemado and Joga.The analyzes was carried out during the rainy season when ground water intrusion is high. The well water samples were collected following standard procedure for sampling. The choice of the sampling locations was based on closeness to dumping site, proximity to residential area, closeness to cesspool, septic tanks and burial ground.

On collection, the samples collected were preserved immediately with HNO_3 to keep the metals in solution and were labeled carefully, stored in iced blocks before transferring to the laboratory for further analyzes. The samples were tested for heavy metal (Cd, Pb and Fe) using Atomic Absorption Spectrophotometer (AAS)

Table 1. Heavy metal concentration in water samples.

			Parameters		
Sample Code	**Locations**	**Coordinate**	**Cadmium (mg/l)**	**Iron (mg/l)**	**Lead (mg/l)**
S01	Yidi Rd, Aiyetoro	N07.24684, E003.044050.0270.0490.279	0.027	0.049	0.0279
S02	Idagba, Aiyetoro	N07.24353, E003.038040.0250.2710.109	0.025	0.271	0.109
S03	Oke Oyinbo I, ,Ayeitoro	N07.24171, E003.003220.032	0.144	0.23	0.23
S04	Oke Oyinbo II, Ayeitoro	N07.24126, E003.03219	0.04	3.619	0.132
S05	Idofoyi I,Ayeitoro	N07.24045, E003.02893	0.01	ND	0.181
S06	Saala,Ayeitoro	N07.23607, E003.03031	0.01	ND	0.102
S07	Ilupeju,Ayeitoro	N07.24071, E003.03539	ND	ND	0.199
S08	Eemado,Ayeitoro	N07.23775, E003.026170.0070.0090.294	0.007	0.009	0.294
S09	Joga, Aiyetoro	N07.23247, E003.025710.003 ND0.224	0.003	ND	0.224
S10	Joga, Ilaro Rd, Ayeitoro	N07.22881, E003.02604 ND0.1310.208	ND	0.131	0.208

RESULTS AND DISCUSSION

Tables 1 and 2 showed the summary of the results of heavy metal concentration in hand dug wells in the study area. It was observed that 70% of the hand-dug well contains cadmium above the specified WHO limit (0.003mg/l). All the well contain lead above the specified standard (0.01mg/l) and 10%of the well contain iron more than the standard (0.3).From these result, most of these wells were not suitable for domestic purposes for which they are presently used for in some of the residential area in the study area. 70% of tested samples contain detectable amount of cadmium with concentration above the maximum contaminant level (0.003mg/l) suggested by World Health Organization (2006) in Fig. 2. This is of concern because cadmium has carcinogenic properties as well as long biological half-life (Orisakwe *et al.,* 2006) leading to chronic effect as a result of accumulation in the liver and renal cortex (Hammer *et al.,* 2004). It can also cause kidney damage as well as produce acute health effects resulting from over exposure to high concentrations.

Furthermore, the result showed that all water samples contained lead concentration that does not conform to the maximum contaminant level 0.01mg/l. The lead concentration in well samples in the study area fell in the range of 0.102mg/l - 0.294mg/l concentration (fig. 3). This result is of great concern as lead has been recognized for centuries as a cumulative general metabolic poison (Adepoju-Bello and Alabi, 2005). It is a neurotoxin and it is responsible for the most common type of human metal toxicosis. Also studies have linked lead exposures even at low concentration and increases in blood pressure as well as with reduced intelligence quotient in children (Needleman, 1993) and with attention disorders (Yule and Rutter, 1985). Thus the danger of lead poisoning becomes very critical and real for the users.

Table 2. Statistical summary of investigated heavy metal in well at the study area.

Variables	Mean ± S.D (Range)	MCL	No above MCL	% above MCL
Cadmium (mg/l)	0.017 ± 0.016 (0.003-0.066)	0.003 mg/l	7	70%
Lead (mg/l)	0.229 ± 0.061(0.102-0.317)	0.01mg/l	10	100%
Iron (mg/l)	1.076 ± 2.393 (0.009-8.406)	0.3 mg/l	1	10%

NOTE: MCL is Maximum Contaminant Level set by [7] for drinking water.

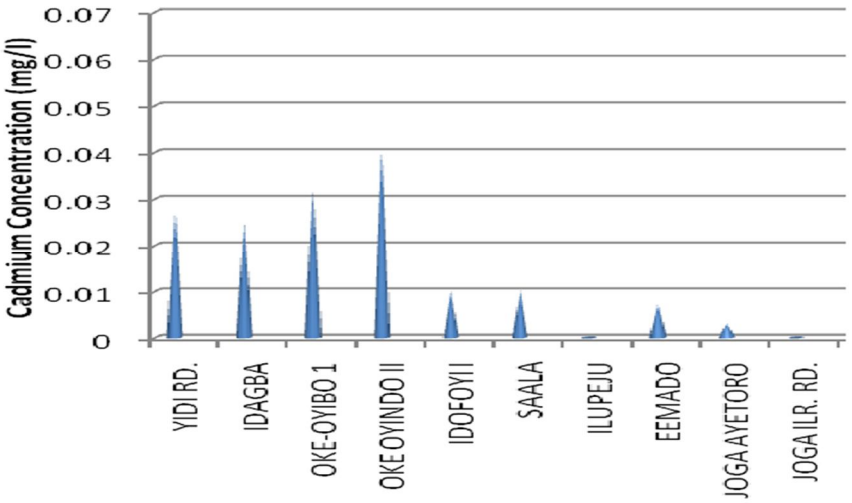

Figure 2. Cadmium levels in water samples.

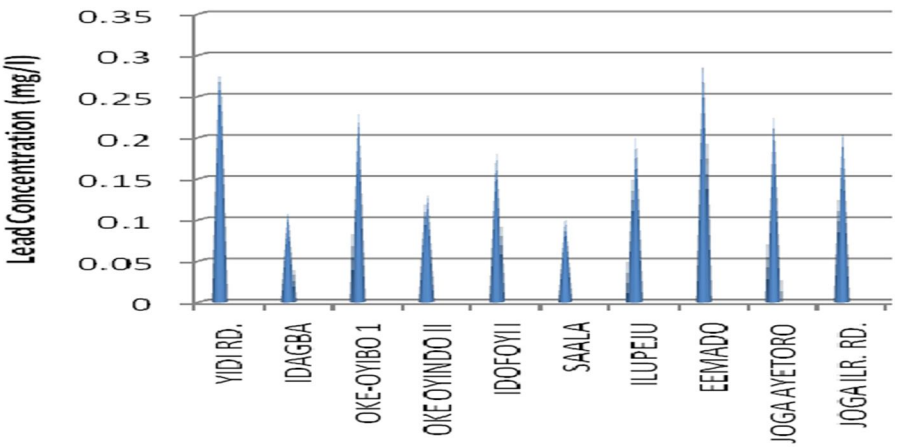

Figure 3. Lead levels in water samples.

The result water analysis showed that 10% of tested samples have detectable amount of iron with concentration ranging from 0.009mg/l - 3.619mg/l (fig.4).The remaining percentage have lower amount of iron contained in them. Water containing iron is known to cause deleterious effect on human health. Excessive iron in water makes water turbid, discoloured (brownish colouration), and imparts an astringent taste to water.

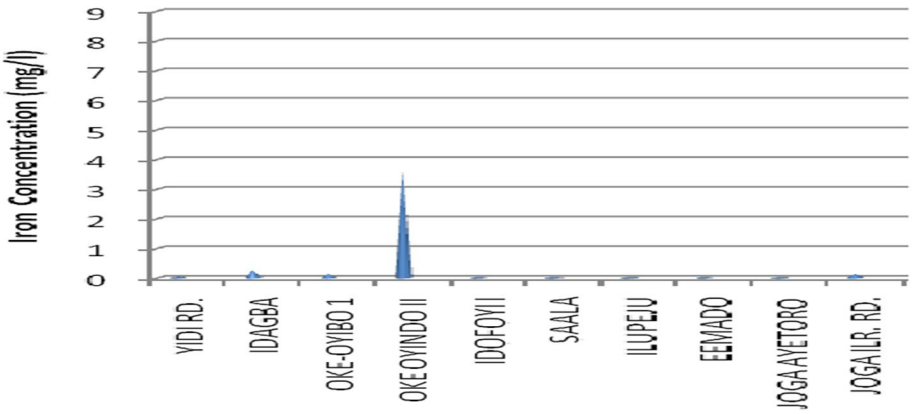

Figure 4. Iron level in water samples.

CONCLUSION

Hand dug wells in Ayeitoro area are contaminated with Cadmium, Lead and Iron. This implies that the well water in the study location is unsuitable for drinking. Hence, need for that Periodic water sampling and analysis, where affordable, water must be treated before consumption and Public enlightenment on water quality should be encourage to foretell the looming danger from water contamination/pollution.

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