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Assessment of Groundwater Quality in Nekede Community, Owerri, Imo state, Nigeria.

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Abstract
The heavy metal assessment on the quality of three samples of ground water from different location in Nekede, was carried out using AAS Unicom Solar 966. The results from the analysis shows that Umuerim Nekede (Um_1) had Zn (0.132mg/l), Fe (1.181mg/l), Pb (0.055mg/l) and Cu (0.041mg/l), Umuokomoche Nekede (Um_2) had Zn (0.010mg/l), Fe (0.157mg/l), Pb (0.045mg/l) and Cu (0.505mg/l). While, Umuokoto Nekede (Um_3) had Zn (0.052mg/l), Fe (0.51mg/l), Pb (0.253mg/l) and Cu (0.546mg/l).
The PH, turbidity, conductivity and hardness were within the W.H.O permissible standard of 3.00, 0.300, 0.01 and 2.00 for Zn, Fe, Pb and Cu respectively for drinking water, except the sample of Um_3 for the month of July with higher value of conductivity 1320 μscm^{-1} and hardness of 100mg/l. These could be attributed to the presence of dumpsite in the area which could leach during heavy rain in the month of July.

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I. Introduction

Heavy metal are metals with higher atomic weight, atomic number and higher density. Some heavy metals are either essential nutrients such as Fe, Cu, and Zn or relatively harmless e.g. Zd, Hg, Pd. The sources of heavy metals includes mining, industrial waste, Agricultural run-off etc. The pollution of the surface and ground water by heavy metals constitute serious concern because of its effect on the socio-economic and public health. The heavy metal contamination causes changes in the physio-chemical composition of the water and make it unsuitable for human consumption. The toxicity of these metals has been demonstrated throughout history. Greek and human physicians diagnosed symptoms of acute lead poisoning before toxicology became a science. Exposure to heavy metals have been linked with developmental, retardation of various cancer, kidney damage and even death. ***[1,2]***

In Nigeria like any other part of the world industrialization is believed to be the major cause of water pollution due to efficient discharge from processing industries. Heavy metals become toxic when not metabolized by the body and accumulate in the soft tissues. The heavy metal may enter the human body through food, water, air or absorption through the skin when they come in contact with humans.

A research on the determination of the level of some heavy metals in water collected from an irrigation area of Kano state, Nigeria showed the presence of heavy metals capable of polluting the environment **[2,3]**

Similarly, researchers pointed out that various classes of vegetables grown by irrigation farming were formed to heavy metals such as Pb, Co, Cr and Fe.**[4,5]**

The heavy metal bio-accumulation potential of mushroom studied showed that mushroom can bio-accumulate heavy metal from contaminated soil or water.**[5]**

The study area Nekede, Imo State, Nigeria has a population of 80,000 residents and keep increasing yearly as a result of the increasing in the number of students admitted in the institution.

Data from Environmental Protection Agency (E.P.A) shows more than 50 tons of waste are generated from this area. These waste are heaped on the surface which account for contamination of the area. Also preliminary investigation shows that at least 40% of people living within these environment have serious health and economic implication such as acute renal failure, liver failure diarrhea, urinary tract infection and typhoid which are also water borne diseases.**[6,7,8]**

The aim of these research is to assess the quality of ground water in Nekede community, Owerri, Imo State, Nigeria

II. Materials And Method

SAMPLE COLLECTION

The ground water sample were obtained at three different locations in Nekede community namely UM_1(Umuerim Nekede), UM_2 (Umuokomoche Nekede),UM_3 (Umuokoto Nekede). The threesamples were collected in polythene bottle which was thoroughly washed and filled with distilled water and rinsed severally before water sample collection. Some physicochemical parameter of water sample were measured and the sample bottle were tightly covered immediately after which the date and time of the collection were noted. The water sample were taken to the laboratory for analysis.

Each of the parameter under examination was carried out according to a standard procedure with good experimental error to ensure precision and accuracy.

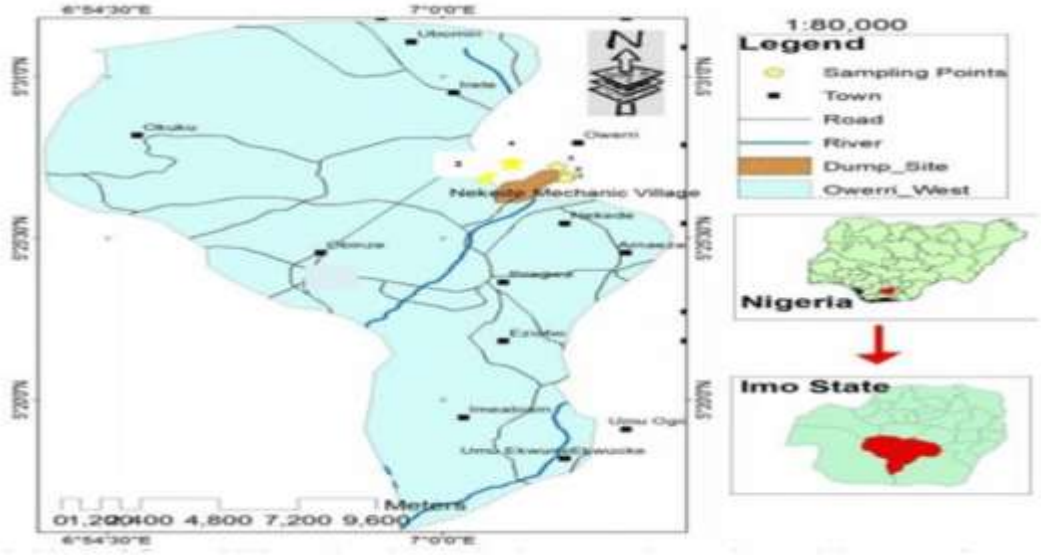

Fig 1: Showing the Map of Nekede Community where Dumpsite were located

III. Result And Discussion

The physiochemical properties such as PH, turbidity, conductivity, PH, and hardness of water sample collected from the month January, April –July 2019 in three different sampling point namely UM_1, UM_2, and UM_3shown below;

TABLE 1: Shows the Physiochemical Parameter of Water Sample from January, April and July 2019

Sampling site	month	PH	Conductivity μscm^{-1}	Turbidity NTU	Hardness (Mg/l)
UM_1	JANUARY	6.54	130	11	89
UM_2	JANUARY	6.55	132	8	80
UM_3	JANUARY	6.51	128	9	82
UM_1	APRIL	6.59	131	10	87
UM_2	APRIL	6.50	133	12	88
UM_3	APRIL	6.50	141	11	90
UM_1	JULY	6.53	140	12	90
UM_2	JULY	6.54	169	13	91
UM_3	JULY	6.59	1320	13	100

From the result presented in table 1 above. The PH of all the water sample falls within the WHO recommended range 6.5 to 8.5.**[9,10]** The conductivity assessment was found to fall below the WHO maximum level of 1200 μscm^{-1} except for the sample of UM3 collected on the month of July, 2019.With conductivity value of 1300 μscm^{-1}. The sudden raised in the conductivity value could be due to leaching of the nearby dumpsite (sample UM_3 collected in the month of July 2019) which could have accelerated by increase in the rainfall experience during the period under review.**[5]**

The total hardness was found to fall within 81-91 mg/l for all the samples except the $UM_3$with higher value of 100 mg/l. This could be as a result of higher dissolved solute at a high flow rate of the rain during the July period of the year. The turbidity of the sample was above the WHO limit of 5NTU threshold. The result of the AAS analysis on the three samples UM_1, UM_2 and UM_3collected in the month of January, April and July 2019 shown in table 2 below.

TABLE 2: Show concentration of heavy metal (mg/l)in the three samples for January, 2019

METAL Mg/L	METHOD OF ANALYSIS	UM_1	UM_2	UM_3	WHO
Zn	ASTMD 1691	0.130	0.017	0.050	3.00
Fe	ASTMD 2144	1.181	0.187	0.510	0.300
Pb	ASTMD 3559	0.055	0.015	0.283	0.01
Cu	ASTMD 3557	0.041	0.503	0.546	2.00

TABLE 3: Shown concentration of heavy metal mg/l in the three sample for April, 2019

METAL Mg/L	METHOD OF ANALYSIS	UM_1	UM_2	UM_3	WHO
Zn	ASTMD 1691	0.131	0.018	0.031	3.00
Fe	ASTMD 2144	1.162	0.143	0.1460	0.30
Pb	ASTMD 3559	0.051	0.043	0.231	0.01
Cu	ASTMD 3557	0.038	0.410	0.437	2.00

TABLE 4: Shown heavy metal concentration (mg/l) in the three sample UM_1, UM_2 and UM_3 for July, 2019

METAL Mg/L	METHOD OF ANALYSIS	UM_1	UM_2	UM_3	WHO LIMIT
Zn	ASTMD 1691	0.132	0.019	0.035	3.00
Fe	ASTMD 2144	1.167	0.142	0.471	0.30
Pb	ASTMD 3559	0.052	0.045	0.045	0.01
Cu	ASTMD 3557	0.039	0.431	0.448	2.00

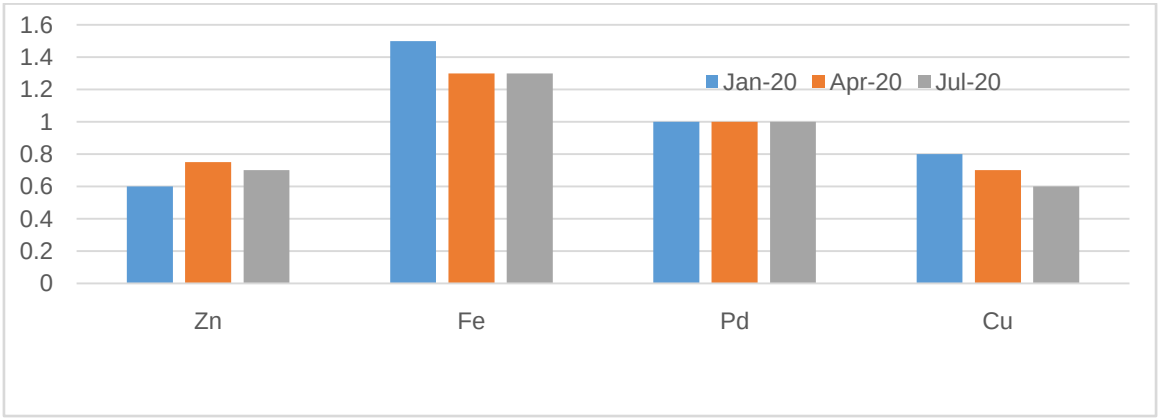

Fig 2: Showing the concentration of Heavy Metal in Each Sample for the Month of Jan, Apr and July 2020.

Key:

Y-axis=Concentration of Heavy Metals in mg/l

X-axis=Heavy Metals

The results of the analysis for the concentration (mg/l) of the heavy metal for the month of January, April and July 2019 were shown in table 2-4. The highest concentration of iron (Fe) 1.187mg/l was recorded from water sample $Um_1$for the month of January 2019. The value when compared with WHO standard indicates that it has exceeded maximum allowable unit for drinking water **[3]**. The higher value of the iron in the Um_1water sample could be as a result of the presence of a nearby battery charge workshop and dumpsite as shown in Fig 1. The higher value of Fe concentration was noticed also in the same water (Um_1) for the month of April with (1.162mg/l) and July with (1.167mg/l).

The variation in the concentration of Zn for the month of January, April and July from different site increases in order 0.30<0.31<0.32mg/l for January, April 0.017<0.018<0.091mg/l and July 0.051<0.052<0.055mg/l for Um_1, Um_2 and Um_3 respectively.

The value of Pb was found to be higher in Um_3 0.0271mg/l for the month of July with a lower value recorded 0.051mg/l for the month of April. The concentration of Cu found in the three water sample Um_1, $Um_2$and Um_3 were all below the WHO recommended safely level.

IV. Conclusion

The analysis of the three sample of water namely Um_1, Um_2 and Um_3 collected during the month of January, April and July 2019 showed substantial compliance with the WHO standard allowable limit for drinking water as recorded from the parameter analysis. However, the analysis cannot be said to be the same about the water near the dumpsite particularly during raining season of the month of July.

Further studies are also encouraged in biological and physio-chemical analysis to comprehensively ascertain the level of fitness of these ground water.

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