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Determination of heavy mental in groundwater resource across sapele local government area

Collins O. Muwarure[1] and Ugbune Ufuoma[2]

[1]Ohorhe Secondary School, Orhorhe, Delta State, Nigeria.

[2]Department of Chemistry, School of Sciences, Delta State College of Education, Mosogar, Nigeria.

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ABSTRACT

The concentration of lead, nickel, magnesium, copper and chromium in ground water resources across sapele local government area were assessed in other to ascertain if their concentration show conformity to world health organization (WHO) stipulated standard. In this study, fifty ground water samples were collected randomly across the study area. The result obtained shows that nickel, chromium, copper ranges from 0.90 – 1.00, BDL – 0.06, 0.30 – 1.40, BDL – 0.15GML-1 respectively while lead was below detection limits. The result when matched with world health organization standard revealed that the water are portable.

Introduction

Groundwater has been traditionally considered to be a pure form of water because of its filtration through the soil and its long residence time on the ground. However groundwater is not as pure as traditional assumed. This is because water is an excellent solvent and it can contain a lot of dissolved chemical s. as documented by American chemical society (1993), groundwater moves through rocks and surface of the soil. It has a lot of opportunity to dissolve substances as it moves and in the process, its chemistry can be grossly modified.

The quality of groundwater depend on the physicals properties, such as thickness of the rock, sediment type and the location of the qualifier. These physicals properties play a large part in determine whether contaminants from the land surface will reach the groundwater. The risk of contaminants is greater for unconfirmed aquifers than for confirmed aquifers. This is because unconfirmed aquifers are usually nearer to land surface and it lacks and overlying confining layers to impede the movement of contaminants (American institute of professional geologists, 1986)

It has been shown by cherry (1987), that pollutants which causes groundwater pollution come from two categories of sources; point sources and distributed or non-point sources. Landfills, liking gasoline storage tanks liking septic tanks and accidental spill are example of point sources. Infiltration from the farm land treated with pesticide and from farm land treated with pesticide and fertilizer is an example of and none—pointed sources

However, the most significant point sources are municipal landfills and industrial waste disposal site. It is significant because landfills are likely to remain the major method of disposal for domestic refuse in the near future and so represent a continuing threat to groundwater quality. That was why, Hamil and Bell (1986)recommended that, a landfill site should be underlain by at least 15m of impermeable strata should be more than 2km away. Anyway the risk of landfill increases when toxic chemicals are involved.

Tele:
E-mail addresses: itoje007@gmail.com

Heavy metals are considerable environmental concern due to their toxicity and accumulative behavior hence it is not advisable to consume polluted water without subjecting to proper and effective treatment. Generally issue in the environmental pollution of heavy metals in ground water resources is very scanty, hence the objective of this study is to assess heavy mental concentration in ground water resources across sapele local government area.

Result and Discussion

Table 1: Descriptive Statistics Of Concentration Level Of Pb, Ni, Mg, Cu And Cr In Hand Dug Well Water In Sapele Local Government Area In Delta State.

Parameter (mg-1)	N	Minimum	Maximum	Mean	Standard deviation
Lead	36	BDL	BDL	-	-
Nickel	36	0.30	1.40	0.90	0.20
Magnesium	36	0.90	4.00	-	1.00
Copper	36	BDL	0.0	-	-
chromium	36	BDL	0.15	-	-

BDL = below detection limits
N = number of hand dug well from which samples collected.

Table2; Potable Water Standard (W. H. O)

Parameters($mg1^{-1}$)	Maximum Allowable	Desirable level
Lead	0.05	Nil
Nickel	5.00	Nil
Magnesium	150	60
Copper	1.00	Nil
Chromium	0.05	Nil

Sources: Asokhia(1995)

Table 3: Descriptive statistics Of Concentration Level of Pb,Ni,Mg,Cu And Cr in bore hole Well Water In Sapele Local Government Area if Delta State.

Parameter ($m^{-1}g$)		Minimum	Maximum	Mean	Standard Deviation
Lead	4	BDL	BDL	-	-
Nickel	4	0.50	1.40	0.90	0.30
Magnesium	4	1.00	4.00	2.50	1.0
Copper	4	BDL	0.40	-	-
Chromium	4	BDL	0.09	-	-

BDL =Below Detection limit

N = Number of borehole wells from which samples were collected.

Materials and Method

Groundwater samples were collected randomly across the study area (sapele local Government area). Two liters of polyethylene containers were used in collecting the samples and before there were used, they were first cleansed with HCL, thereafter, they were rinsed with water and finally with distilled water, in order, to avoid contamination of containers from extraneous contaminant. Sample were preserved with 2ml of conc. HNO3, per liter and they were stored in a refrigerator 4C until the samples were required for analysis. Metal stock solution were prepared and diluted as described by Ademoroti (1996). Sample solutions were analyzed with Perkins - Elmer 3110 Atomic Absorption spectrophotometer. Wave lengths used were 217.0, 232.0, 285.0, 324.8, 357.9nm for lead, nickel magnesium, copper and chromium respectively. The experiment was also done for blank in other to overcome instrumental drift.

The results of the concentrations of the heavy metals determined shown in table 1 and 3 indicate that the concentration of lead in the groundwater across the study area is predominantly below detection limit. The is due to the absence of waste generated by mining, plumbing and coal industries in the study area. Nickel was present in the 50 groundwater samples. However, the value recorded for nickel concentration show conformity to WHO standard for potable water. Nickel is known to occur naturally in groundwater because it is present in soil. However, at high concentration it becomes toxic to human. Heart and liver are the most susceptible or accumulation points in chronic or acute nickel exposure.

The Level of magnesium in the groundwater samples were lower than $60mg1^{-1,}$ the WHO standard for desirable level for potable water. These low values recorded for magnesium in the groundwater samples, might be due to the nature of the rock beneath the in the study area. The concentration of copper in the groundwater resources were generally below $1.00mg1^{-1}$, the WHO maximum tolerance limit for potable water. 36% of the groundwater samples (i.e. 18 sampling location), have chromium values that are greater than $0.05m1^{-1}$, the WHO maximum tolerance limit for chromium in potable water.

The cause of the high concentration of chromium in the 18 sampling location may not be strictly related to industrial activities, since samples from the rural area also show similar concentration with the water samples from the urban areas. Where industries are mostly located.

However , the cause may be attributed to the acidic nature of the groundwater since research has show that groundwater resources in the Niger Delta area are bound to be acidic because of gas flaring that is associated with the activities of the oil industries operating in the area. Recent studies (Offodile, 1992; Etu - Efeotor and Odigi 1983), documented that, in an area, where there is acidic groundwater, the solubility of heavy metals is permissible.

Conclusion

The result obtained from the various parameter are within the recommended range provided by the World Health Organization. It is essential to measure and monitor gas flaring activities of oil companies operating in the study area. This is to avoid an increase in the acidic level of the ground water which make the solubility of heavy metals to be more permissible.

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