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PHYSICO-CHEMICAL AND BACTERIOLOGICAL ASSESSMENT OF RIVER MUDZIRA WATER IN MUBI, ADAMAWA STATE.

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ABSTRACT- Many people in Africa depend on water from rivers and borehole, but purity of the drinking water from these sources remains questionable. Mudzira River being the longest River in a village called Vimtim located in Mubi North Local government area in Adamawa State was studied in the months of September to December, 2012 to ascertain the suitability of the water for human consumption and other related uses. Five study point: inlet (A, B), middle (C) and out let (D, E) were adopted for monitoring the physico-chemical parameters using standard procedures. The mean total temperature values were A (25.00^{0}C), B (24.50^{0}C), C (25.50^{0}C), D (24.00^{0}C) and E (24.00^{0}C. Average P^H values were A (8.00), B (7.87), C (8.20) D (8.37) and E (8.13). The average conductivity values were A (73.90 μcms^{-1}), B (73.11 μcms^{-1}), D (74.00 μcms^{-1}) and E (73. 80 μcms^{-1}). The average total dissolves solid value of each sample were A (17.10), B (17.10), C (20.00) D (21.64) and E (21.60.). The average turbidity value of sample were A (47.00), B (47.00), C (50.00) D (53.00) and E (50.00). Average total hardness value are A (20.00mg/l), B (20.00mg/L) C (24.00mg/L), D (20.00mg/L) and E (20.00mg/L). The average chloride content were A (12mg/L), B (16mg/L), C (12 mg/L) D (16mg/L) and E (16mg/L). The average calcium content were A (0.3mg/L) B (0.4mg/L), C (0.3mg/L), D (0.3mg/L) and E (0.2mg/L). The average content of magnesium were A (12mg/L), B (16mg/L), C (16Mg/L), D (12mg/L), E (12mg/L). The lead content of River Mudzira water was negligible. The mean coliform count were A (4), B (3), C (6), D (7), and E (4).The values of the parameters studied were within the WHO/NAFDAC recommended standards, excepts for total coliform levels. In conclusion Vimtim residents consuming untreated water from River Mudzira are potentially exposed to possible acute, sub chronic or even chronic water borne diseases like typhoid fever, dysentery, diarrhea etc.

Key words: River Mudzira, Physico-chemical parameters, coliform.

I. INTRODUCTION

One of the major environmental issues of our time is the rising demand of water quality conditions suitable for use by human as well as aquatic organisms. Rivers, lakes and dams are valuable ecological resource that serves many human needs and therefore enhances life by providing a lot of opportunities, (Calamari, 1994).

A large number of Nigeria populations live near small water bodies such as lakes reservoir, swamps and coastal lagoons. They depend on such water bodies as their main sources of family income. Usually, such small systems are subjected to several internet environmental factors as well as more large system. It is a well known fact that water quality conditions are constantly being threatened by pollution from large quantities of waste influences by urbanization, industrialization and Agriculture. The increasing level of using chemical herbicides, pesticides and improper domestic and salvage disposal has created a using awareness of national management of aquatic resources and control of waste discharged from the environment (Egborge, 1991).

Water quality conditions according to Boyd and Lichokoper (1990) include all the physical, chemical and biological factors that influence the beneficial use of that water.

II. STUDY AREA

Mubi region refers to the Northern part of Sardauna province which now forms Adamawa Northern Senatorial district as defined by INEC (1996). The region lies between latitude 9^0 and 11^0 North of the equator and longitude 13^0 and 13^045^1 East of the Greenwich Meridian. Mubi region is bounded in the North by Borno State, in the West by Hong and Song L.G.A and in the South and East by the Republic of Cameroon.

Mubi has a land area of 4728.77km and a population of 759645 in 2003 (1991census project figure) (Adebayo, 2004).

Rainfall in Mubi region is controlled by the movement of the inter-tropical discontinuity (I.T.P). It divides the zone between cool and dust air mass and the warm and wet air mass. The movement of ITP determines the onset and cessation at a particular time of the year.

Between November and March, the whole Mubi region is under the influence of ITP zone weather. There is hardly any rainfall received during this period. April is a month of transition between the dry and wet season in Mubi region. During this period, there is scanty rainfall in most parts of the region. Such rains are often accompanied by strong and devastating wind storms, (Adebayo, 2004).

The month of May to October constitute the wet season in Mubi region. During this period, the region is under the influence of ITD zone B weather. Rainfall increases from May to August which has the highest amount and from September to October decreases at a sharp rate. This abrupt decrease is due to south ward movement of the ITD which is twice faster than its northward passage (Adabayo 2004).

Agriculture is a major employer of Labour in Mubi region as such is important sector in the region economy. Three agricultural systems can be identified in Mubi namely terrace Farming practiced by hill – top settlers, Sedimentary cultivation and mixed faming, (Yohanna, 2004).

III. MATERALS AND MATHODS

Five (5) sampling stations were selected along River Mudzira, Mubi Adamawa state for this study. The stations include the inlet of the River as station A and B, middle of the river as station C and D and the outlet of the river as station E. The study was carried out in the months of September to December; 2010.The water samples were collected inside a clean dry, 1 liter transparent glass bottle. Water samples from each station were collected about a dept of 30cm and were transported to the laboratory immediately for analysis using standard procedures for the collection of the water samples (APHA, 1998). The temperature of the water samples was determined on spot using digital thermometer at the point of collection. The pH and conductivity of the water samples were determined using combine pH and conductivity meter, model EC500.

The turbidity of the water samples was determined in laboratory using water analyzer (Lamotte Scl 04).

The total dissolved solids of each water samples collected were determined using the T.D.S meter (model EC500). The chloride content of the water samples were determined using calorimeter. The total hardness of the water samples were determined by filling the test tube to the 12.9ml line with the samples water and 5 drops of hardness reagent was added and swirl to mix.

The metals such as magnesium and calcium were analyzed in accordance with the standard method of analysis of raw water samples (APHA, 2002).

The lead concentration was determined in each of the water samples using a Bulk scientific Atomic Absorption Spectrophotometer model 210 at appropriate wave length.

IV. ENUMERATION OF COLIFORM

Total Coliform counts in the samples were determined using the multiple tube fermentation technique (APHA, 2002). This involved inoculating multiple fermentation tubes containing Mac Conkey broth with 1 ML of water sample at 37^0C for 24 hour, after which the count was done with a suwtex 560 colony counter. Detection of E. Coli in the water was carried using the presumptive and confirmative tests (APHA, 1998).

V. RESULTS AND DISCUSSION

The results of physico chemical parameters of the river Mudzira water was as presented in figure 1:

The mean temperature of the river was 24.6 ± 0.5. The highest and the lowest mean temperature were $25{:}5^0$C and 24^0C. They all fall within the range given by W.H.O (2006) which is 25^0C.

The mean P^H Value of River Mudzira water was 8 ± 0.17. The highest and the lowest mean pH values ranges from 7.87 in sample C to 8.37 in sample D. This range is in line with the standard given by NAFDAC 2004. The variation in pH is very small, 0.036 and this may be due to the concentration of different salts present at each point. The range of pH is in line with that reported by of Ugwu and Mgbenka (2006). pH is generally considered to have no direct impact on humans. However, long -term intake of acidic water can invariably lead to mineral deficiencies (Adekola, *et al*., 2015).

The conductivity values of River Mudzira showed some little variation, it ranges from 68.00 μ ms^{-1} in sample D. The reason for this variation can be attributed to the amount of waste and agricultural chemicals, discharge into the stream at different times.

The maximum total dissolved solid content recorded was 21.64mg/L in sample D while the minimum was 17.1mg/L in sample A and B. These values are relatively small compared to the maximum given by W.H.O (2006) which is 500mg/L. This shows that the amount of dissolved suspended solid particles is very low.

The mean turbidity values was 49.4 ± 2.24. It ranges from 47mg/L in sample A and B to 53mg/L in sample D. This range does not exceed the turbidity value given by W.H.O (2004). The turbidity of River Mudzira may be due to the presence of undissolved and suspended solids, mud, silt, algae and micro-organism.

The total hardness ranges from 20mg/L to 24 mg/L. This may be due to the presence of magnesium and calcium salts which dissolved as the river flows. This value though small, is not good for industrial purposes especially in dyeing, washing, and in water boiler but could be good for drinking to develop strong teeth, bones and perhaps for its taste.

The chloride content ranges from 12ppm in sample A and C to 16ppm in sample B, D, and E. Chloride is a measure of protection against any contamination which may occur. This value if compared to the value given by W.H.O (2006) and NAFDAC (2004) which is 200mg/L is within the permissible limits, which also agrees with those obtained by Maitera, *et.al* (2011) for Rivers Gongola.

The Calcium content of River Mudzira water is very small. It ranges from 0.2mg/L to 0.4mg/L. This is still within the standard given by NAFDAC 2004.

The magnesium content of the River Mudzira water ranges from 12ppm in sample A, D and E to 16ppm in sample B and C. This may be due to the presence of magnesium salt present in the River. This value is also within the allowable value given my NAFDAC and W.H.O.

From the Atomic Absorption Spectrophotometric analysis, the absorbance of lead ion ranges from 0.004 to 0.005mg/L. Its concentrations could not be computed from the calibration curve. Therefore, the concentration of lead compound is negligible.

Copper, cadmium and manganese are not detected in water sample which differ from those obtained for Rivers Benue by Maitera, *et.al* (2011).

The result of the microbial examination of the River Mudzira water was shown in Fig II. The result shows that River Mudzira water contains numerous coliform bacteria which range from 3 to 7 per sample. Data as obtained was disturbing since the presence of any type of coliform bacteria in drinking water is not accepted by WHO water quality standards. This observation supports reports by Anaele (2004), Erah, *et al* (2002) and Egwari and Aboaba (2002), that most underground and surface water sources in urban centers of Nigeria contain substantial microbial contaminants including very harmful ones like E.coli, S. typhii among others. This

contamination may be due to the attitude of the people living around the River. They defecate in bush around the River which were washed into the river whenever rain fall. Also animal dumping around the river as they gaze and drink water from the river increases the microbial load of the river.

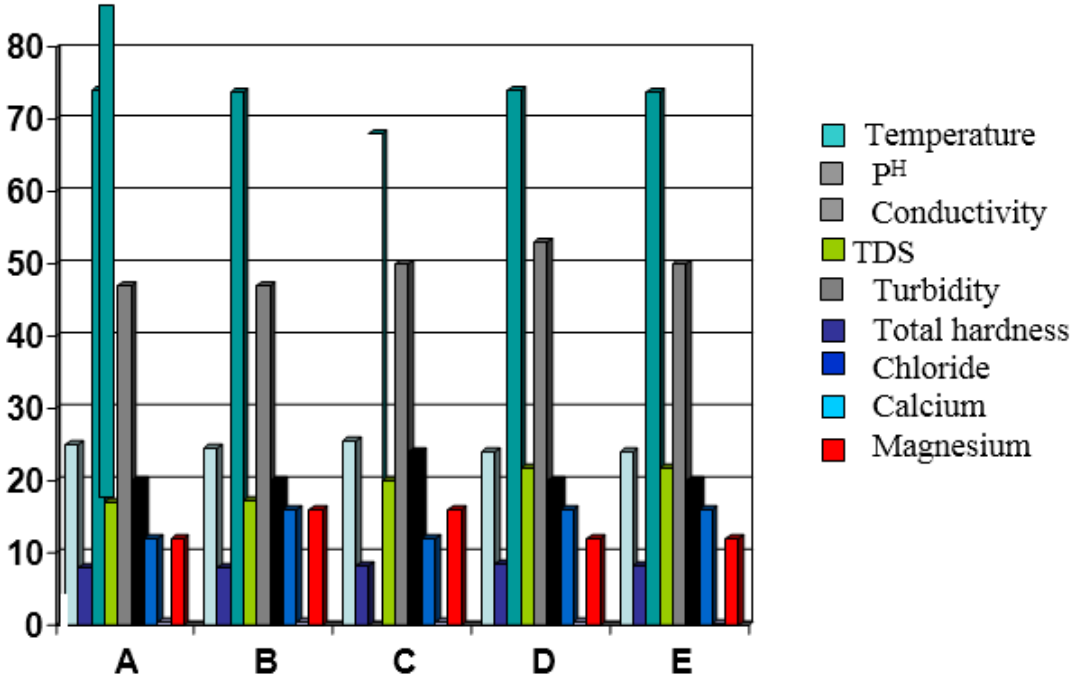

Fig I: Histogram Distribution of Samples

Table II: Total coliform count of each sample of the River Mudzira water

Water Samples	**Coliform Count**
Sample A	4
Sample B	3
Sample C	6
Sample D	7
Sample E	4

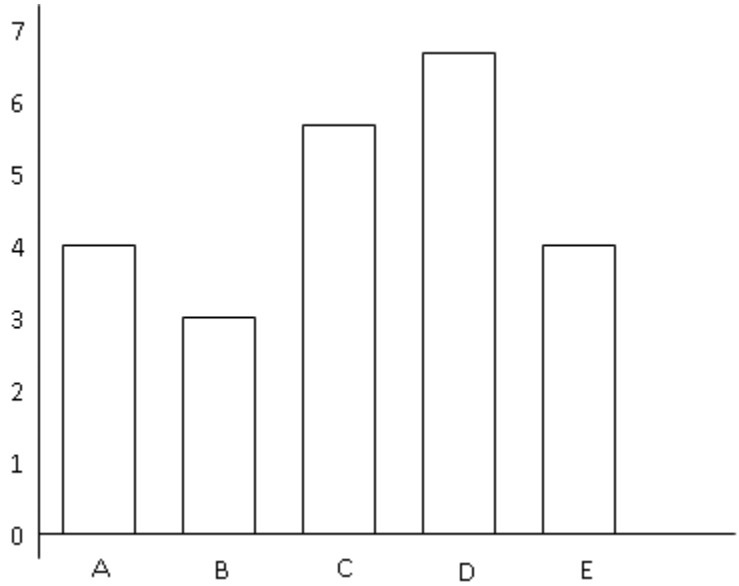

Fig II: Coliform Distribution of Water Samples

VI. CONCLUSION

Data obtained in this study agree with several other surveys earlier carried out in other surface and underground waters. It can therefore be concluded from the study that Mubi (Vimtim) residents consuming untreated water from River Mudzira are potentially exposed to possible acute, sub chronic or even chronic water borne diseases like typhoid fever, dysentery, diarrhea etc.

VII. RECOMMENDATION

It is recommended here that chlorinating agents be provided by the government at heavily subsidized prices for all and Sundry to assist in the elimination of pathogenic microorganism in the River Mudzira water supplies. River Mudzira is also recommended for irrigation and other domestic work and not for human consumption. Activities around the river Mudzira such as washing of cloth, bathing and swimming in the river and grazing around the river should be restricted by educating the community on the health effect of polluted water.

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