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Physico-Chemical Analysis of Water Sources in Awka-urban, Anambra State

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Abstract:- The focus of this study was analyse the physico-chemical properties of water sources in Awka Urban, Anambra state. The water sources include bore well/hole water. It was an experimental research carried out in Awka metropolis between July 1, 2018 and October 10, 2018. The experimental research design was adopted. Five different villages in Awka were selected as sample area for the study. A total of 5 water samples from the area were collected using bottles. The bottles were washed with tap water with the aid of detergent and ethanol. The chemical parameters of the samples determined using standard method as soon as the samples got into the laboratory. HANNA Phep (model H 19) was used to determine the water PH. In the same manner, TDS/TEM meter was used to determine the water samples temperature. The electrical conductivity of the water samples was also determined using pre-calibrated conductivity meter model 611 in measuring the electrical conductivity. The titration method by means of EDTA solution was used to determine the total hardness of the collected water samples. The dichrometre refluction method was used to determine the chemical oxygen demand (COD) of the collected water samples. The alkali azide method was employed in the determination of the biochemical oxygen demand (BOD) of the water samples. The chlorides content of the water samples were determined using silver nitrate solution. The titremetric method was followed in determining the dissolved oxygen of the water samples. The findings of this study indicated that water sources in Awka metropolis contained heavy chemicals and as such not safe for human consumption. It was recommended among others that, Water got from any source within Awka should be properly boiled in order to make it safe for human consumption.

Keywords: Water, water source, physico-chemical analysis.

I. INTRODUCTION

Water is essential to life. Human beings, animals and plants, all need water to survive. Not only that water is necessary for human beings, it is used in industries, hospitals, schools and other related places.

Water can be pure or impure. Pure water is good for human consumption while impure water is not portable. According to Venkatesharaju, Ravikumar, Somashekar and Prakash (2010), the physio-chemical and biological contents of water define its healthy ecosystem. There are several factors sustaining the scarcity of water world-wide. One of these factors is the increase in human population. The world population is growing higher on daily basis. In developing countries like Nigeria, the ever increasing population has adversely affected the provision of good quality drinking water. The drinking of contaminated water has contributed significantly to the ever-increasing rate of sickness and diseases in developing countries (Dhanaji, Shagufta and Pramod, 2016).

According to Al-Sabahi, Abdul, Wan, Al-Nozaily and Alshaebi (2009), there are basically two natural sources of water. They include surface water and ground water. Surface water includes fresh water; water from lakes; water from rivers, water from streams, oceans and seas. According to Mc-Murry and Fay (2014), surface water is any water body which is found flowing or standing on the surface while ground water is the water stored naturally beneath the earth surface. The ground water includes water from borehole and wells.

As observed by Bhalme and Nagarnai (2012), human activities have contributed greatly to the pollution of the surface water. Some of these human activities include agricultural activities, industrial activities, urban development among others. These activities pose great threat to the health of surface water. According to Khalid, Haider, Waseem, Zahra and Murtaza (2011), only 1% of water is safe for drinking. A total of 97% is sea water and as such, not portable; 3% is fresh water with 2% containing chemicals which rendered it unsafe for human consumption.

Apart from the surface water, ground water could be putt to portable use but this depends on its quality in terms of chemical contents. Apart from drinking, ground water could be put into other uses. In areas without surface water, the exploration of the ground water becomes imperative. However, the underground water especially the borehole is prone to contamination due to human activities. Pollutants resulting from soil water infiltration go down the soil barriers thereby contaminating the underground water sources. It is also noted that leachates coming from pit toilets also contaminate well water and borehole water (Al-Seibasi, Abdul, Wan, Al-Nozaily and Alshaebi 2009).

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Awka metropolis is faced with the challenge of portable water. In some areas, it is futile to drill boreholes. No matter the depth of the borehole, it cannot bring out water. Some areas also do not require deep wells; the wells do not last the year round, coupled with the fact that the shallow wells get easily contaminated.

The focus of this study, therefore, is to do an analysis of the physico-chemical properties of water sources in Awka Urban, Anambra state. The water sources include bore well/hole water. The people in the area of study use the water for domestic and agricultural purposes. They also drink the water.

II. EXPERIMENTAL PROCEDURE

This study was carried out in Awka metropolis between July 1, 2018 and October 10, 2018. The experimental research design was adopted. Five different villages in Awka were selected as sample area for the study. A total of 5 water samples from the area were collected using bottles. The bottles were washed with tap water with the aid of detergent and ethanol. The chemical parameters of the samples determined using standard method as soon as the samples got into the laboratory.

HANNA Phep (model H 19) was used to determine the water PH. In the same manner, TDS/TEM meter was used to determine the water samples temperature. The indicated value remained constant for one minute before the reading was taken. This was to ensure that the results were as accurate as possible. In measuring the temperature of the water samples, the researcher washed the TDS meter using distilled water and cleaned it with clean tissue paper each time before measuring the next sample.

The electrical conductivity of the water samples was also determined. The researcher used pre-calibrated conductivity meter model 611 in measuring the electrical conductivity. Before this was done, the researcher washed the electrode and beaker severally with distilled water. The researcher measured the electrical conductivity at a room temperature. Each water sample was poured into the beaker with appropriate volume to ensure that the electrode was properly dipped. Each water sample was scaled and noted appropriately. The titration method by means of EDTA solution was used to determine the total hardness of the collected water samples. Furthermore, dichrometre refluction method was used to determine the chemical oxygen demand (COD) of the collected water samples. The alkali azide method was employed in the determination of the biochemical oxygen demand (BOD) of the water samples. The alkalinity of the water samples was measured by titrating the water with standard HCL by means of indicator.

The chlorides content of the water samples were determined using silver nitrate solution. The end point was yellow to brick red. In the same manner, the titremetric method was followed in determining the DO (dissolved oxygen) of the water samples.

III. RESULTS

The following results emerged from the experiment:

- Water samples collected from Aroma junction contained, in percentages 428 total dissolved solid (TDS); 1.76x10-3 electrical conductivity (EC), 175 total hardness (TH); 40 chemical oxygen demand (COD); 660 Biochemical Oxygen Demand (BOD); 53.2 Alkalinity (AK); 94.97 chloride (CL) and 3.7 dissolved oxygen (DO).
- Water samples from Kwata junction indicated its contents in percentages which include TDS (622); EC (2.0x10-3); TH (320); COD (160); BOD (800); AK (40.1) CL (99.96) and DO (4.8)
- The chemical contents of water samples gotten from Eke Awka market (in percentages) include TDS (589); EC (1.86x10-3); TH (265); COD (480); BOD (780); AK (57.2); CL (64.97); and DO (4.6).
- Water samples collected at Amenyi market contained the following percentage of chemicals: TDS (734); EC (1.98x10-3); TH (190); COD (640); BOD (360); Ak (40); CL (44.98) and DO (5.2)
- Water samples collected from Amawbia junction indicated contents of the following percentages of chemical elements: TDS (760); EC (2.08x10-3); TH (700); COD (560); BOD (900); AK (46.4); CL (109.96) and DO (3.2).

IV. DISCUSSION OF FINDINGS

The findings of this study indicated that water sources in Awka metropolis contained heavy chemicals and as such not safe for human consumption. For example, the WHO range for water alkalinity is 500mg/L. However, the water samples examined contained less than 78mg/L alkalinity. This rendered the water unsafe for human consumption; its temperature in the maximum is 25^{o}C. However, the temperature of the water samples ranged between 24 and 26^{o}C. This also rendered the water in Awka quite unsafe for human consumption.

The findings of this study agreed with previous findings. For example, Khalid, Haider, Waseem, Zahra and Murtaza (2011) found that PH of water sample range of 8.4. Again, Umavathi, Kumar and Subhashini in Dhannaji, Shagufta and Pramod (2016) found high chloride content which ranged from 19.99 to 109.96mg/L. This high chloride content is an indicator that water has been polluted.

V. CONCLUSION

The investigation of physio-chemical properties of water sources in Awka metropolis indicated heavy contents of chemical elements in the water sources. The water in Awka therefore is not portable, thus, not drinkable.

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RECOMMENDATIONS

The following recommendations were made:

- Water got from any source within Awka should be properly boiled in order to make it safe for human consumption
- The people in the area should be properly educated on the dangers of drinking unsafe or untreated water
- Public enlightenment efforts need to be enhanced in the entire area, to improve on personal and public hygienic lives of the people. Efforts in this direction can reduce the problems of microbial pollution/contamination in public water supply sources.

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APPENDIX 1: WATER SAMPLES FROM DIFFERENT PLACES IN AWKA URBAN, ANAMBRA STATE.

S/N	Source	Location
1	Bore well/hole water	Aroma Junction
2	Bore well/hole water	Kwata Junction
3	Bore well/hole water	Eke Awka Market
4	Bore well/hole water	Amenyi Market
5	Bore well/hole water	Amawbia Junction

Table 1