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BACTERIOLOGICAL ANALYSES OF WATER USED FOR DRINKING FROM BOREHOLE OF OMERGA REGION, OSMANABAD DISTRICT IN MAHARASHTRA

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ABSTRACT

Four groundwater samples have been collected from Omerga region for the study of physicochemical parameters. Rapid development in recent years has led to an increased demand for water, which is increasingly being fulfilled by groundwater abstraction. None of the samples complied with bacteriological standards as Total coliform counts generally exceeded 1,600 MPN/ml, and pathogen count such as *Salmonella-Shigella* counts and *Vibrio cholera* counts were very high. A detailed knowledge of the water quality can enhance understanding of the hydro chemical system, to achieve this; a hydro chemical investigation was carried out in the study area. Hand pump samples were chemically analyzed for major physicochemical parameter in order to understand the different geochemical processes affecting the groundwater quality. The analytical results shows higher concentration of total dissolved solids (26.56%), chloride (35.33%) total hardness (63%) and magnesium (83.66%) which indicates signs of deterioration as per WHO and ISI standards. The presence of pathogens in water for drinking purposes is of public health significance considering the possibility of the presence of other bacteria, protozoa and enteric viruses that are implicated in gastro-intestinal water borne diseases and the low infectious dose for these water borne pathogens.

KEYWORDS: Groundwater pollution, Bacteria, protozoa, Physicochemical parameters, TDS, etc.

INTRODUCTION

The public health significance of water quality cannot be over emphasized. Many infectious diseases are transmitted by water through the fecal-oral route. Diseases contacted through

drinking water kill about 5 million children annually and make 1/6thof the world population sick (WHO, 2004). Water is vital to our existence in life and its importance in our daily life makes it imperative that thorough microbiological and physio-chemical examinations be conducted on water.

Water is a chemical substance essential to all known forms of life. It is referred to as the liquid state of the hydrogen-oxygen compound (H20). About 1,460 teratonnes of water cover over 71% of the earth's surface (oceans and other water bodies). There is about 1.7% of water below the ground in aquifers and 0.001% in the air as vapors.[1] All living things on earth depend on water for their water. Water has been ranked by experts as second to oxygen as essential for life.[2] About 70% of the body mass of an average adult human being is made up of water. Water makes up a large part of the protoplasm and is the medium in which chemical reactions take place in the body. It is important in the transportation of excretory products, blood and hormones.[3] Water is of immense benefit to man, adequate care should be taken when assessing water intake and usage. The best standard of purity is required for drinking water as the water we drink is got from different sources like wells, streams, lakes, rivers (surface water), ground water (boreholes) etc. Ground water has various advantages over surface water as it is not exposed to water pollutants associated with surface waters. It is in view of this that the World Health Organization recommended that drinking water supplies should be well analyzed based on their contamination or pollution level.[4] Very few people in small towns have access to safe water supply. Only about 5 percent get water from protected ground sources through boreholes.[5,6] Some agencies argued that it is not sufficient merely to have access to water in adequate quantities, the water also needed to be of adequate quality to maintain good health.[6] Such water must be free from toxic biological, physiological and chemical contaminations. The widespread reports on pollutants in groundwater have increased in recent years and have resulted in increased public concern about the quality of groundwater. The importance of potable water, both for domestic and industrial uses, has created concern for water quality analysis.[7,8] Groundwater bodies are prone to contamination from both anthropogenic and natural activities.[9] Boreholes, though more protected as a result of inherent chemical constituents of permeable rocks through which the water flows.[10,11] can limit the quality of the water as they may have dissolved impurities which came from rock and sand strata through which the water flowed or passed.. Water quality monitoring is very necessary as pollution of water affects both quality of water and health of the consumers. This study was carried out to determine the physico-chemical and bacterial

analysis of four different boreholes in Omerga region in order to assess the portability and usability of their borehole water as domestic water supply.

MATERIAL AND METHODS

The current study was designed to investigate the conditions of groundwater contamination in the study areas. The physicochemical study was undertaken by randomly collected 05 Hand pump water samples from Omerga Region during June 2016 to December 2016. Samples were drawn with a pre cleaned plastic polyethylene bottle. Prior to sampling, all the sampling containers were washed and rinsed thoroughly with the groundwater. Water quality parameters such as pH and electrical conductivity (EC) were analyzed immediately. Total Dissolved Solid (TDS) were computed by multiplying the electrical conductivity (EC) by a factor (0.64). Total hardness (TH) as CaCO3 and calcium (Ca) were analyzed titrimetrically, using standard EDTA. Magnesium (Mg) was calculated by taking the differential value between total hardness (TH) and calcium (Ca) concentrations. Chloride (Cl)) was determined titrimetrically by standard AgNO3 titration. The content of Sodium (Na) and Potassium (K) in groundwater was estimated flame photo metrically. All parameters are expressed in milligrams per litre (mg/l) and mill equivalents per liter (m eq/l), except pH (units) and electrical conductivity (EC). The electrical conductivity (EC) is expressed in micromohs/cm (μS/cm) at 250C.

Bacteriological Analysis

Bacteriological characteristics were determined as described by Bezuidenhout et al., (2002). The Most Probable Number-multiple tube technique was used for coliform enumeration. Nutrient agar (NA), *Salmonella-shigella* agar, Thiosulphate citrate bile salt sucrose agar was used to determine heterotrophic bacterial, *Salmonella and Shigella, Vibrio* choleraerespectively. All plates were incubated at 35oC for 24hrs. Presumptive colonies were confirmed by gram staining and biochemical reactions and each plate was given a positive or negative score. Isolates were confirmed by some conventional biochemical test SCA, (2002).

Result of the physicochemical parameters of Omerga Region

All parameters are in mg/L except pH and Turbidity, Turbidity in NTU.

Sample	Tur.	pH	TDS	TH	Ca	Mg	Cl	Na	K	Fe	F	SO_4	NO_3
(S1)	0.3	7.5	644	423	136	48	18	20	2	0.19	0.36	44	47
(S2)	0.5	7.6	365	291	83	24	24	13	104	0.17	0.12	29	16
(S3)	0.3	8.0	1245	274	69	79	34	25	1	0.17	0.72	48	19
(S4)	0.3	8.1	413	785	47	39	380	46	4	0.15	0.25	11	15

RESULT AND DISCUSSION

The collected water sample from different stations was the colorless and odorless and the temperature of the entire water sample is maintained 27^0c.

pH: It is a measure of how acidic/basic water is. The range is from 0 - 14, with 7 being neutral. pH less than 7 indicate acidic, whereas a pH greater than 7 indicates a basic. pH is really a measure of the relative amount of free hydrogen and hydroxyl ions in the water. The standard range pH is 6.5 to 8.5 given by ISI and WHO.

Turbidity: turbidity is the measure of relative clarity of a liquid. Clarity is important when producing drinking water for human consumption. Turbidity can provide food and shelter for pathogens. If not removed, turbidity can promote growth of pathogens in the distribution system, leading to waterborne disease outbreaks, which have caused significant cases of gastroenteritis throughout the United States and the world. Although turbidity is not a direct indicator of health risk, numerous studies show a strong relationship between removal of turbidity and removal of protozoa. In the water sample of all stations have the turbidity below the standard range of ISI and WHO.

Total Hardness: In ground water hardness is mainly due to carbonates, bicarbonates, sulphates, chloride of Ca and Mg. The data of the analysis reveal that the total hardness of S4 (785 mg/l), are above the standard value of WHO.

Total Dissolve Solid (Tds): TDS is directly related to the purity of water. The TDS is the term used to describe the inorganic salts and small amounts of organic matter present in solution in water. The principal constituents are usually calcium, magnesium, sodium, and potassium cations and carbonate, hydrogen carbonate, chloride, sulfate, and nitrate anions. The TDS of water sample of S3 (1245 NTU) having the range above the standard values of WHO.

Calcium: CALCIUM is a mineral that is an essential part of bones and teeth. The heart, nerves, and blood-clotting systems also need calcium to work but higher the amount of calcium causes harmful effects on the health. In the water sample of the many Omerga Region the calcium is present above the range given by WHO, the stations such as S3 (380 mg/l).

Magnesium: Hardness of water is directly concern with the magnesium and the sample of the different Omerga region ranging below the standard value given by the WHO.

Chloride: In the investigated water samples in which the water sample of S4 (380 mg/l) which were found above the limit of ISI and WHO.

Sodium: The sodium concentration of the all sample of Omerga Region is lower than the prescribed limit by WHO and ISI.

Potassium: It is found that the content of potassium is higher in the water sample of S2 (104mg/l)

Iron: The concentration of Iron in the water sample of S3 (0.72 mg/l) ranging above the standard value given by the WHO and ISI.

Fluoride: Fluoride can occur naturally in water and the fluoride concentrations above recommended levels, which can have several long term adverse effects, including severe dental fluorosis, skeletal and weakened bones The World Health Organization recommends a guideline maximum fluoride value of 1.5 mg/L as a level at which fluorosis should be minimal. In the analysis of the water sample it is found that the fluoride is below the standard range**.**

Sulphate: Sulfate is a constituent of TDS and may form salts with sodium, potassium, magnesium, and other captions. Sulphate is commonly found in nature and can be present at concentrations of a few to several hundred milligrams per liter.

Nitrate: The nitrate concentration in the water sample of the S1 (47 mg/l) ranging above the standard limit of ISI.

CONCLUSION

In conclusion, proper well location and construction, control of human activities to prevent sewage from entering water body is the keys to the avoiding bacteria contamination of drinking water. It is evident that water borne diseases are due to improper disposal of refuse, contamination of water by sewage, surface runoff, therefore programmes must be organized to educate the general population on the proper disposal of refuse, treatment of sewage and the need to purify our water to make it fit for drinking because the associable organisms are

of public health significance being implicated in one form of infection or the other. In areas lacking in tap water as in rural dwelling, educative programmes must be organized by researchers and government agencies to enlighten the villagers on the proper use of surface water.

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