WATER QUALITY INDEX OF WELL WATER OF NAGPUR CITY WITH REFERENCE TO SOME HEAVY METALS AND OTHER PARAMETERS

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Abstract:

Well water quality investigation has been carried out in Four zones of Nagpur City (Maharashtra), India, during December-2017 to March-2018 (Winter and Summer) where due to urbanisation and population growth , the municipal corporation water supply is not sufficient and people use water from wells for drinking and other purposes. In view of this fact various physicochemical parameters such as pH, electrical conductivity, total hardness as well as mercury, chromium and arsenic were analysed. A systematic calculation of correlation coefficient among different physicochemical parameters was performed. Comparison of these parameters of the water samples with WHO and Indian Standards showed that well water of some areas is bit contaminated and not safe for human consumption. Whereas there is no evidence of heavy metal contamination has been found.

***Keywords*:** Well water, Mercury, Chromium, Arsenic, Total Hardness

I. INTRODUCTION:

The present study addresses the issue related to the presence of heavy metals like arsenic, chromium and mercury in well water of Nagpur (Maharashtra) India. Major development in agriculture, urban infrastructure, anthropological activities have resulted in these elements sharing substantial increases over their pristine levels in the environment for want of reliable data, the task of making realistic estimates of the fluxes of these elements and consequently the degree of human exposure is beset with the many difficulties. Much of the information which is likely to be useful in this content is locked up in reports prepared by government agencies for internal use and hence not easily accessible (Krishnamurthy CR,1987). This overview is therefore, restricted in its scope and indicates trends rather that absolute realities (Krishnamurthy CR,1987). One of the greatest challenges of the twenty first century is to provide an adequate supply of safe water for household consumption to everyone. But, the demand of water is constantly on the rise. On the other hand, the quality of water resources is deteriorating due to the anthropogenic activities. Hence, it is essential to analyse the ground water to study the variation in quality parameters, and the results can be documented for further use. (Alagumuthu C. and Rajan M. 2008).

Besides the water supplied in the pipeline by Municipal Corporation, the vast majority of population depend upon the well water in the study area. In view of this fact the effective maintenance of water quality of local resources (Wells), monitoring of their quality parameters is mandatory. This data also strengthens the national and local water quality data base.

II. MATERIALS AND METHODS:

Study Area: Four zones of Nagpur City.

Water analysis:

Water samples from 4 wells from four zones of Nagpur City (MS) India, were collected in clean, screw capped high density polyethylene bottles during winter months December-2017 to February-2018 and summers season i.e. March, to May 2018. The samples were analysed for determining the water quality parameters viz. pH, electrical conductivity (EC), Total Hardness (TH), Chloride (Cl), (APHA, 2008; Trivedi and Goel,1986). and the analysis of Arsenic (Ar), Mercury (Hg) and Chrmonium (Cr) was carried out as per the standard methods BIS,(2004): IS 3025 (Part-2). The correlation coefficient for the physicochemical parameters was determined, (Sukhatme B.V. 1984, Goon A. M. 2008)

III. Result & Discussion :

Table 3.1: Chemical Parameters of Well waters of four zones of Nagpur city

Physiochemical Parameters	Zone 1			Zone 2			Zone 3			Zone 4		
	Average	S. D.	S. E.	Average	S. D.	S. E.	Average	S. D.	S. E.	Average	S. D.	S. E.
pH	7.70	0.05	0.03	7.42	0.03	0.02	7.70	0.08	0.04	7.62	0.08	0.04
Electrical Conductance	444.17	29.44	14.22	1459.50	92.14	44.51	635.17	38.36	18.53	872.83	58.38	28.20
Total Hardness	135.17	3.14	1.52	359.83	29.14	14.08	226.33	16.01	7.73	173.50	10.79	5.21
Mercury	0.005	0.00	0.00	0.005	0.00	0.00	0.005	0.00	0.00	0.005	0.00	0.00
Chromium (mg/l)	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.
Arsenic	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	

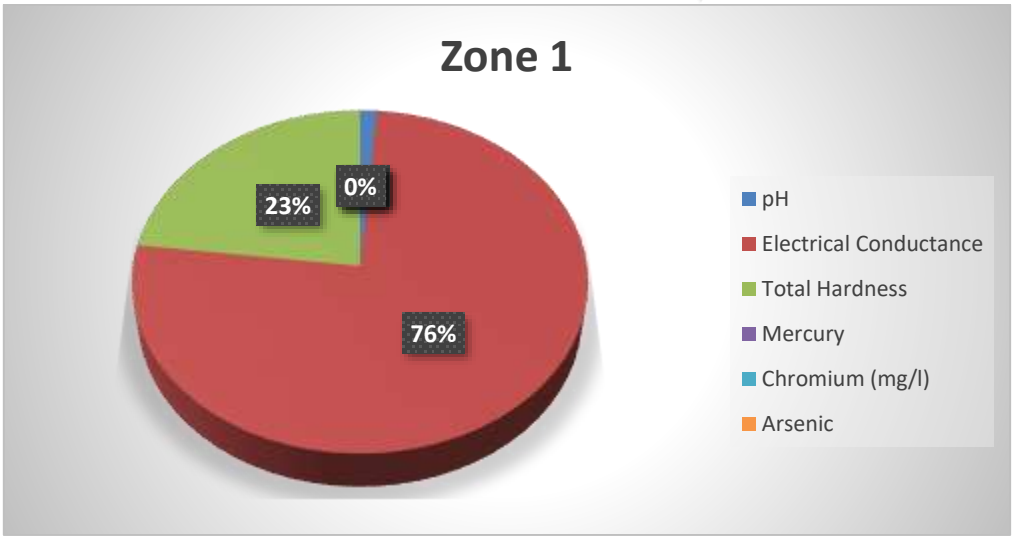

Figure 3.2.1: Statistical representation of Chemical parameters of well water of Zone -1 of Nagpur city

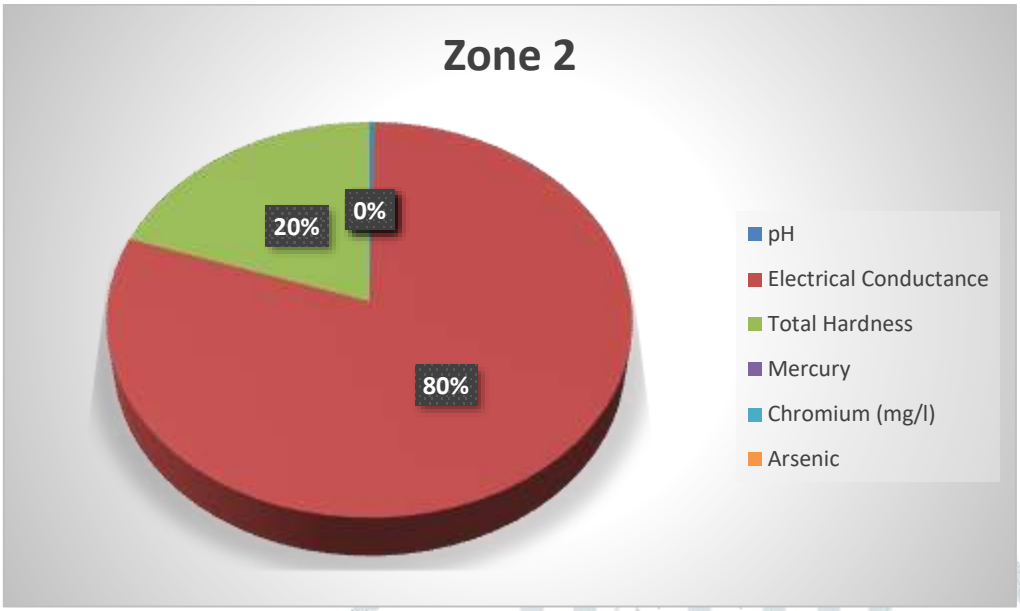

Figure3. 2.2: Statistical representation of Chemical parameters of well water of Zone -2 of Nagpur city

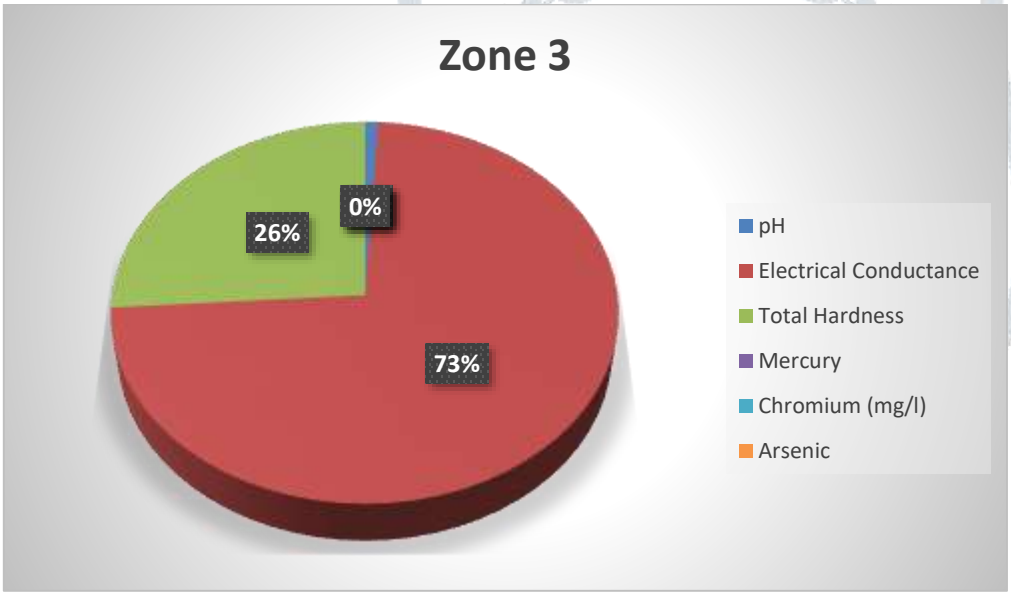

Figure 3.2.3: Statistical representation of Chemical parameters of well water of Zone -3 of Nagpur city

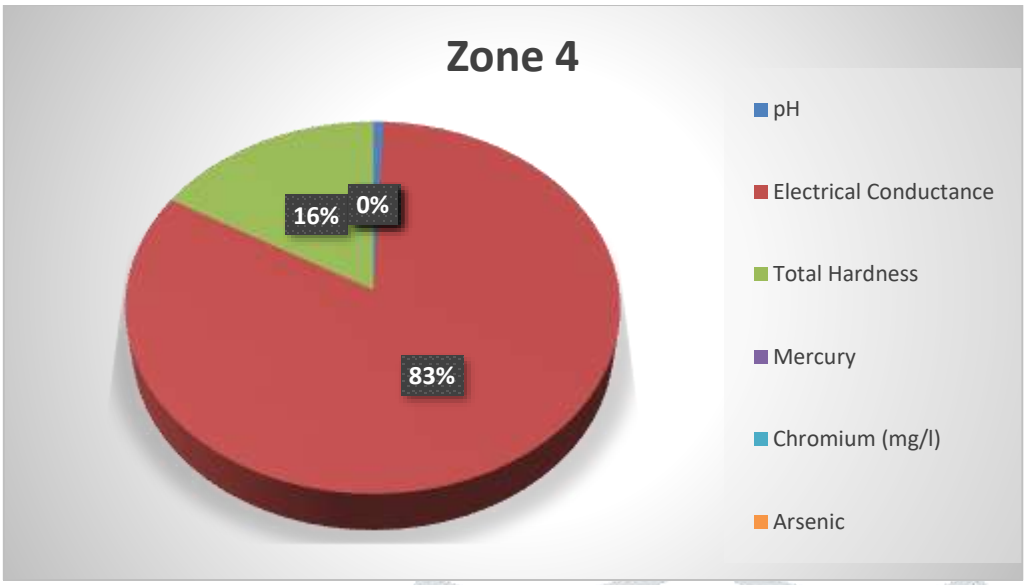

Figure 3.2.4: Statistical representation of Chemical parameters of well water of Zone -4 of Nagpur city

The data tabulated in Table 3.1 is recorded for six months i.e. December- 2017 to May-2018 covering winter and summer season of the year.

The results revealed that the pH ranged from 7.8 to 7.4. The minimum pH 7.4 was observed in zone-2 and maximum pH 7.8 in zone-1 and 3 (fig-3.2.1 & 3.2.3). The value of pH showed the slightly alkaline nature of water. The trend of pH values in all four zones indicates values in that there is steady increase in summer months (April and May). The factors like air temperature bring about changes the pH of water. Most of the bio-chemical and chemical reactions are influenced by the pH. The reduced rate of photosynthetic activities reduces the assimilation of carbon dioxide and bi-carbonates which are ultimately responsible for increase in pH the oxygen values coincided with high temperature during the Summer month (Kamble et al., 2009).

The electrical conductance was recorded in the range of 400 to 1660μ Mho/cm. The maximum permissible limit of this parameter for drinking water is 300μ Mho/cm. However, the average electrical conductivity exceeds this limit because of its high values. The well of zone-2, 3 and 4 contains more electrolytes (Fig-3.2.2,3.2.3, 3.2.4) may be due to more anthrorganic activities (Saravan Kumar and Ranjit Kumar, 2011).

Total hardness was found in the sample water ranges from 130-420 mg/L. Hardness has no known adverse effect on health. However maximum permissible level prescribed by WHO for drinking water is 500mg/l. Therefore the study samples are safe for drinking purpose. According to some classifications, water having hardness upto 75mg/L is classified as soft, 76-150mg/L is moderately soft, 151-300 mg/L as hard (Dufor and Becker, 1964) and more than 300 mg/L as very hard. On this basis, the results show that all samples collected from zone-2 were very hard.

Throughout the study the concentration of mercury, was found ≤ 0.005, and the concentration chromium and arsenic was ≤ 0.01 which is a indicator of safe water quality (Fig-3.2.1,3.2.2,3.2.3,3.2.4).

Arsenic contamination of ground water is found in many countries through the world including US (Smedley and Kinniburgh, 2002), which is often due to naturally occurring which concentrations of arsenic in deeper levels of ground water causing serious arsenic poisoning to large number of people.

Inorganic mercury is the most common form that present in drinking water but is not considered to be very harmful to human health. However kidney damage may result from exposure to inorganic mercury through other sources.

The monitoring of mercury levels must take place very three months if the level is higher than to set guideline and specific measures must be taken to reduce those levels. In present study the mercury level was found within the limit persistent, which suggests no indication of mercury poisioning of water samples.

Drinking water may contaminate by the chromium. It may cause health problems if found in amounts greater than the health standard set by the United States Environmental Protection Agency (EPA).

Chromium is an odourless and tasteless metallic element, chromium is found naturally in rocks, plants, soil and volcanic dust and animals. Chromium-3 (Trivalent chromium) is an essential human dietary element. It is found in many vegetables, fruits, meats, grains and yeast, chromium-6 (Hexavalent chromium) occurs naturally in the environment from the erosion of natural chromium deposits, and can be produced by industrial process. These are demonstrated instances of chromium being realised to the environment by leakage, poor storage or inadequate industrial waste disposal practices.

The daily chromium requirement for adults is estimated to be 0.5 – 2μg of absorbable. In some occupational studies, increased incidences of genotoxic effects such as chromosomal abbreviations and sister chromatid exchange have been found in worker exposed to chromium (VI) compound (Janus and Kranjnc, 1990).

In present study the level of chromium is within the desired range and therefore the samples are safe for use.

Conclusion:

The results of comparative study of some water parameters of four zones of Nagpur City show that the water of the study area contains some pollutants with respect to total hardness and electrical conductivity at the same time. There is no evidence of heavy metal like Arsenic, Mercury and chromium contamination.Further investigation is needful to evaluate the water quality. The hardness of water in some zones need to be addressed otherwise the people of these area are prone to the immediate health problems.

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