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Drinking Water Quality Characteristics from Different Domestic Places in Amravati City, Maharashtra

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Abstract

Water quality in terms physic-chemical characteristics from different places in Amravati city, was studied by analyzing the water samples from tube wells, domestic wells and also from tap water which were used for drinking and other domestic purposes. The parameters such as chloride, hardness, free CO_2, dissolved oxygen, pH, conductivity and alkalinity were analyzed. The recorded values were compared with recommended water quality criteria. Higher hardness was found in tube well water but not in tap water samples.
Key words : Drinking water quality, Domestic places, Bone wells, Tap water, Open wells.

Early people recognized the importance of water from quantity view point, due to pressure of human activity, urbanization and industrialization, the ground water sources are degraded gradually, therefore pure, safe, healthy and odorless drinking water is a matter of deep concern (1). There are may pollutants to enter water viz. organic and inorganic Pollutants, heavy metals, pesticides, fluorides (2). The availability of adequate water supply in terms of both quantity and quality is essential to human existence (3). The quality of ground water plays vital role in assessing the availability of safe water for drinking, irrigation and industrial use. Improper drainage system, septic tank and solid waste disposal resulted in contamination of ground water (4). With this view the present investigation was carried out at Amravati city, Maharastra.

Methods

The study area was situated at east, west, north and south regions of Amravati city. The area was selected on the basis of water lifting for potability and domestic use by the residents. Water samples were collected in plastic bottles. The analysis was done from ten houses from each region.

The water samples were analyzed for pH, electrical conductivity, total hardness, alkalinity, chloride, sulphate, nitrate, DO and CO_2 by using standard technique in laboratory (5).

Results and Discussion

The physico-chemical parameters analyzed from the samples of water in November 2006 to study the drinking water quality criteria in Amravati city in different areas. The samples of water were collected from taps supplied by water supply department ; bore wells used for domestic and drinking purposes and open wells constructed by residents.

The temperature fluctuation ranged from 29 to 32 C in all the sample waters and the water did not have any objectionable odor, whereas the tap water was

Table 1. Standards and crietria for drinking water. Based on World Health Organization (WHO) and Indian standards the permissible limits in potable water.

Parameters	WHO Maximum acceptance	WHO Maximum allowable	Public Health committee Premi-ssive	Public Health committee Execu-ssive
pH rarge	7-8.5	-	7-8.5	-
Conductivity (mm hos/cm)	2.5	3	NA	NA
DO (mg/l)	NA	6.0	NA	NA
free CO_2(mg/l)	NA	6.0	NA	NA
Hardness (mg/l)	250	500	300	600
Alkalinity (mg/l)	200	600	250	750
Chloride (mg/l)	200	600	250	1000
Nitrate (mg/l)	-	45	20	50
Sulfate (mg/l)	200	400	250	400

Table 2. Physico-chemical parameters of drinking water of different areas in Amravati city.

Parameters	Gadge Nagar Tap water	Gadge Nagar Bore-well water	Gadge Nagar Open well water	Mudharkar Peth Tap water	Mudharkar Peth Bore-well water	Mudharkar Peth Open well water	Sai Nagar Tap water	Sai Nagar Bore-well water	Sai Nagar Open well water	Navasari Tap water	Navasari Bore-well water	Navasari Open well water	Yashoda Nagar Tap water	Yashoda Nagar Bore-well water	Yashoda Nagar Open well water
Temperature (C)	29	31	32	28	31	31	29	30	33	28	31	31	30		30
Color	Unobjectionable														
Odor	Chlorinous	Unobjectionable		Chlorinous	Unobjectionable		Chlorinous	Unobjectionable		Chlorinous	Unobjectionable		Chlorinous	Unobjectionable	
Taste	Tasteless														
pH	7	7	7.1	7.4	7.1	7.3	7.4	7.2	7.3	6.7	6.5	6.7	7.4	7.5	7.3
Conductivity (mmhos/cm)	1.51	1.31	2.33	1.67	2.32	2.51	2.0	1.61	1.82	1.84	0.91	1.53	1.69	2.02	0.97
DO (mg/l)	9.9	4.5	7.7	6.6	3.6	6.1	6.1	5.2	5.3	7.7	5.3	2.9	5.3	9.6	2.9
Free CO_2 (mg/l)	20.8	11.6	9.2	20	64	60	16	72	80	16	54.8	53.2	36	76	96
Hardness (mg/l)	136	598	554	160	472	220	248	652	728	160	548	532	200	252	616
Alkalinity (mg/l)	162	250	124	126	184	177	115	122	198	103	186	156	98	195	187
Chloride (mg/l)	85.08	261.3	201.4	51.3	213.1	221.6	51.6	241.2	162.1	62.4	153.1	193.2	45.4	147.1	116.5
Nitrate (mg/l)	11.6	15.7	16.4	15.3	20.2	31.13	17.4	31.8	24.7	13.3	35.7	27.3	14.7	34.9	22.3
Sulfate (mg/l)	35.4	43.7	47.4	41.2	57.3	63.6	36.8	68.3	71.4	44.7	66.3	72.3	30.7	57.2	66.8

having the chlorinous odor. This odor was due to the chlorination of water done at the central water pumping station.

The hydrogen ion concentration affects the taste of water. Low concentration of hydrogen ion favors corrosion control, while high concentration helps in effective chlorination, chemical coagulation, disinfections and water softening. In the present study the pH in all the water samples was within the limit which shows variation from 6.5 to 7.4 and Navasari region showed slightly acidic trend in all samples with minimum range of PH 6.5 to 6.7. This was within the limit permitted by WHO and Indian Standards of drinking water criteria.

Rapid estimation of the dissolved solid contents of water can be obtained by specific conductance measurement. The conductivity is measured in terms of mm hos/cm and it was found between 1.51 to 2.0 in tap water, 0.91 to 2.32 in bore well water and 0.97 to 2.33 in well water, whereas the lowest conductance was found from well water of Yashoda Nagar and bore well water of Navasari indicating the lower conductance and highest in bore well and well water of Gadge Nagar and Mudholkar peth. All the samples were within the standard limits.

Chlorides in reasonable concentration are not harmful to human ; evapotranspiration tends to increase the chloride and salinity at the root zone of irrigated plants, making it difficult for crops to make up water due to osmotic pressure difference between the water out side the plants and within the plant cells. The chloride was analyzed in terms of mg/liter and was found to be lowest in tap water of Mudholkar peth and Sai Nagar water samples and whereas all samples compared to bore well water and well water were having less chloride contents.

The hardness of waters, caused by multivalent metallic cations, varies considerably from place to place. The hardness reflects the nature of the geological formations with which it is in contact. The total hardness ranged from 160 to 728 mg/liter in well water sample of Sai Nagar which were slightly lower in bore well water of same area and also the samples of bore well from Gadge nagar and Navsari. These areas slightly exceeded the permissible limit for hardness i.e. 100–500 mg/liter recommended by WHO and Indian standard criteria. The total hardness was more in bore well and well water than that of tap water. The hardness is possibly due to higher concentration of bicarbonates, sulfates and chlorides.

Carbon dioxide is a normal component of all natural waters. Presence of free carbon dioxide makes the water acidic, which may affect the health. The free CO_2 measured in terms of mg/liter was comparatively higher in bore well water and well water except in water of Sai Nagar. The sample waters from Mudholkar Peth, Sai Nagar, Navasari and Yashoda Nagar bore well and well water showed higher CO_2 content.

Whereas the dissolved oxygen was found to be more in tap water than that of bore well and well water. All the values of DO are not lower than the permissible standards for drinking purpose.

All the sources had alkalinity values lower than the recommended values. Alkalinity is itself not harmful to human beings. Alkalinity also may be due to the contamination by leaching process through surface water during rainy season.

The nitrate content of well water of Mudholkar peth and Sai nagar was near the maximum permissible limit. The nitrate contents are found due to entry of soil organic matter, organic constituents of plant and animal protein and the nitrogen into water bodies from industrial waste waters, septic tanks and from animal wastes. The sulfate values of all samples from different sources was within limit.

Ground Water Resource Evaluation. Ground water resource evaluation involves the quantitative estimation of two components viz. input and output. To evolve proper management strategies and development of ground water resources, it is essential to estimate of all the components of recharge and discharge to arrive at the ground water balance.

Need for Artificial Recharge. Since the ground water recharge is not upto the mark, the following methods are recommended for artificial recharge of ground water. In cities and towns, defense establishments, universities, central and state institutions, public parks, play grounds have large open areas. Artificial recharge structures such as open recharge shafts and recharge pits can be built in such open areas. The rainwater harvesting of roof top collection is required to be mandatory in urban areas. Such collected water may be diverted into the abandoned wells, recharge shafts and recharge pits. A forestation programmed on a large scale may be taken up in vacant lands, as the trees will reduce the rate of surface water run off and aid in increasing water infiltration. Old water bodies should be protected, as they will contribute to ground water recharge.

Recommendations. The following recommendations were made by the GWB for recharging and improving ground water resources. Regular and systematic collection of hydrometeorological and hydrological data need to be further promoted by increasing the data collection points accompanied by a system for processing of information. To project future water needs it is desirable to have data on use and consumption qualities by different types of users. Problems associated with the use of water in industry need to be studied in greater depth, both in qualitative and quantitative aspects, including questions of input and output quality level of treatment required and recycling of water. Construction of recharge shafts, pits, contour trenches in the large open areas such as defense establishments, universities, public parks, playgrounds and institutions will augment the ground water resources. Protection of water bodies may help in recharge of ground water and environment protection. Comprehensive sewerage system has to be developed to safeguard ground water from pollution.

The depleting water levels can be improved by allowing the rainwater to percolate down to the aquifer. At present most of the rainwater is going down the drains, as proper arrangements are lacking to conserve the rainwater.

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