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Assessment of Water Quality in Hyderabad, India

Anjali Devi C

Professor, Dept. of Food & Nutrition, Osmania University, Hyderabad, India

Abstract: ***Water quality was assessed in twin cities of Hyderabad. A multi stage random sampling procedure was followed. Water supply to hostels, college canteens, and food sale counters and hospitals from various zones of the twin cities were collected. Standard procedures were followed for collection and analysis. Eight important parameters viz., pH, alkalinity, total hardness of water, concentration of calcium and magnesium hardness, chlorine, sodium, and fluoride were analyzed. The results showed differing values within the standard desirable limits as per Bureau of Indian Standards publication indicating that the water is fit for drinking.***

Keywords: Alkalinity, chlorine, fluoride, desirable limits, BIS standard

1. Introduction

Water is one of man's most valuable assets, without which life cannot exist therefore WHO laid standards for drinking water (1). Indian Standards for drinking water are laid by Bureau of Indian Standards (2) , because of the importance of drinking water, water is included as a nutrient on par with protein, calories, minerals and vitamins as per Codex Alimentarious. Twenty first century has to face major challenges of water, energy and air, of them access to safe drinking water has become a major challenge. Studies have shown that consumption contaminated water causes water borne diseases like jaundice, fluorosis, typhoid, cholera etc. (3,4)The Problem of tap water in India is that the water pipe installation is not of the same standard. Old and leaking pipes, leaking material, water storage tanks often cause contamination before the water reaches the tap. Therefore clean public water at source does not mean clean water at home. 37.7 million people in India were affected by water borne diseases due to contamination of water by bacteria (EColi,shigella, vibriocholera) Viruses (hepatitis A, poliovirus, Rota virus) and parasites (E histolytica , hook worm) . Most diseases may not be due to tap water, but lack of access to clean water. BARC in Mumbai found salt containing bromide that is a byproduct of disinfection. Ice water sold in Delhi showed that bottled water had pesticide residues, generally filtered water is safer more convenient than bottled water (5). There are several local brands selling bottled water which may be only filtered water and the risk doesn't make any change. In Hyderabad it was reported that water samples from Musheerabad, Ramnagar, Uppal, Nallacharuvu, (Hyderabad) was contaminated through tanneries, pharma-chemical industries and polluted river Musi, pH was normal but the total dissolved solids exceeded the permissible limits. At Borakpurin Hyderabad the presence of godown of animal skins, bones, fat, plastic factories with poisonous metals and effluents, contamination reached peak level in the ground (6).

The growing urbanization and industrialization is showing its effect on water quality of Hyderabad. The water characteristics of Osmansagar Lake has deteriorated substantially. Reduced inflows coupled with organic pollution and nutrient addition resulted in increased algal activity and reduced dissolved oxygen. (7,8). On the other hand the report released by Union Ministry of Consumer Affairs, based on the tests done by Bureau of Indian Standards (BIS) Hyderabad tap water supplied to households is said to be second safest for drinking in India (4, 10). It is in this context an attempt is made to study the quality of water supplied to institutions and residential areas in Hyderabad through pipeline in the present times.

2. Methodology

Selection of Water samples: A multi stage random sampling procedure was followed. At the first stage, water supplies to various institutions were selected as large group of people reside under one roof. At the second stage the twin cities are divided into 5 Zones – North, South, East, West and Central,At the third stage four categories namely, hostels, college canteens, food sale counters and hospitals are selected from each zone. Four samples of water were randomly collected from each category and each zone.

Collection of samples: Water is collected in aseptic dry containers rinsed two to three times with sample water. The pump nozzle is cleaned made free from dust and rust. Water was then collected directly from the pump early in the morning before anyone could use. Care was taken to see that water does not come in contact with hand, jug or mug.

Analysis of water: Water quality was determined on the basis of eight important parameters viz., pH, alkalinity and total hardness of water, concentration of calcium and magnesium hardness of water, chlorine, sodium, and fluoride of water. Analysis was done on one time collection of samples from different locations using standard procedures.

The average values of the samples at different locations for all the parameters are compared with corresponding standard values of Bureau of Indian Standards (9). A case study was done in Dattatreya Colony (Asifnagar) in old city on physical features of the water lines.

3. Results and Discussion

Water samples were analyzed for physio-chemical properties. The pH value of water is lowest in East Zone (7.2). Highest value is in Central Zone, hospital category which is at the upper limit although it is within the desirable limits. (Table1-1)

Alkalinity of water ranged between 92 – 390 mg/liter, lowest of 92 is at food sale counter of Eastern Zone, highest value of 390 is recorded in Central Zone food sale counter. All of them are within the acceptable limit of less than 400mg/liter (Table 1-2).

Total hardness of water ranged between 100 – 198ppm, lowest value of 100 ppm is in the food sale counters of North Zone, is below the acceptable limit of 300ppm Highest value of 198 is recorded in the hospital category of North Zone and the lowest in the food sale counter of North Zone. The levels are lower than the minimum value of the desirable limits. (Table 1-3)

Calcium content is between 54 to 138 both being in the hostel category of East and Central Zones which is much below the accepted minimum limits of 200ppm. (Table1- 4)

Magnesium hardness of water in all categories is less than the accepted limit of 30mg /liter, highest being in the hospital category of Central Zone and lowest of 6 in the college canteen of North Zone (Table 2-1)

Chlorine content of water ranged between67- 198.5 mg,/liter much below the desirable limits. Lowest value of .67.4 mg/liter was recorded in the Central Zone, hospital category and highest being 198.5 college canteen of East Zone. None of the values have even touched the minimum of the desirable limit of 250mg/litre indicating a close monitoring and regular chlorination of water (Table2-2).

Concentration of sodium in water isbetween 17.5 and 50.5mg/liter. Sodiumis found virtually in all foods and drinking water is no exception. In a study on children no association of sodium in drinking water to occurrence of hypertension was found (10) However sodium may affect the taste of drinking water at levels above 200mg /liter .(Table 2-3)

Fluorine content of all samples are within desirable limits. Water from the hospital category in South Zone recorded highest value of 1.17, least value of 0.49 mg/liter in the hostel category of West Zone (Table 2-4).

Case Study done in Dattatreya colony (Asifnagar) under the old city limits. The study is limited only to the physical features during pandemic days because the analysis is done as part the main line. The colony was established in 1970'swith 50 houses and 250 residents. At that time only a 4" water pipe line which was on top of the drainage line. As both lines come one beneath the other causing possible leakage and intermixing of polluted /drainage water, it is prone to health hazards.

Over the years, colony expanded, many independent houses were converted into apartments. Now there are around 700 houses with more than 4000 residents. The 4 " pipe line ever since then was not changed as a result pressure in the pipeline is low reducing the quantity of water being supplied to households on alternate days. Very often brown muddy water is supplied. When enquired the answer is that chemical is added to purify the water, sometimes answer is that the water board will clarify. The timings are very irregular, water supply can be any time between 6 am to midnight, one has to keep watching almost the day and night.

Another problem is huge trees are planted on either side of the road, the fibrous roots are breaking the pipes and expanding the roots totally blocking the water pipeline. At one place there was no water supply for three months as they could not identify the problem. Finally after constant pursuance and residents identifying the problem the water line clogging was identified and a meter long roots which totally blocked the line was identified and was rectified. At times when there is leak in the drainage line the water for that area bad odor emanates.

4. Conclusion

Results indicated that the water samples were within desirable limits for mineral content and found to be free from microbial contamination showing that the water is safe for drinking. Hyderabad tap water supplied to households is reported as second safest for drinking in India according to the report released by Union Ministry of Consumer Affairs, based on the tests done by Bureau of Indian standards .BIS States that although a range of desirable limit is given ,it advised to adhere to the lowest level which is taken as acceptable level. The case study indicates that the drinking water pipe and drainage lines need to be on opposite side as any leakage can be detrimental to the health of residents, where possible old infrastructure needs to be replaced.

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Table 1: Average pH Alkalinity, Total Hardness and Calcium Hardness of Water

	Category	Areas (Zones)				
		North	South	East	West	Central
1	**Average pH Value of Water Samples**					
	Hostel	7.9	7.9	7.2	8.1	8.0
	College Canteen	7.8	7.3	7.2	7.5	8.4
	Food Sale Counter	8.1	7.4	7.1	8.1	7.3
	Hospital	7.3	8.2	7.2	7.9	8.5
	Desirable Limit : 6.5 – 8.5					
2	**Average Alkalinity Value of Water Samples**					
	Hostel	114	162	130	146	164
	College Canteen	138	146	144	110	134
	Food Sale Counters	130	110	92	138	390
	Hospitals	124	122	108	164	110
	Desirable limits – 400-600mg/liter					
3	**Concentration of Total Hardness of Water**					
	Hostel	144	138	150	146	148
	College Canteen	126	140	120	134	122
	Food Sale Counter	100	110	104	110	112
	Hospital	198	160	120	130	129
	Desirable limits – 300-600ppm					
4	**Concentration of Calcium Hardness**					
	Hostel	102	64	54	68	138
	College Canteen	120	82	82	84	96
	Food Sale Counters	86	56	72	84	86
	Hospitals	70	104	76	80	70
	Desirable limits – 200-400/ppm					

Table 2: Average Magnesium, Chlorine, Sodium and Fluoride Content of Water

	Category	Areas (Zones)				
		North	South	East	West	Central
1	**Concentration of Magnesium Hardness of water**					
	Hostel	22	24	16	28	10
	College Canteen	6	18	28	16	24
	Food Sale Counters	14	14	22	26	16
	Hospitals	28	26	24	10	30
	Desirable limits – <30mg/liter					
2	**Average Chlorine Value in Water**					
	Hostel	77.9	133.4	81.5	87.4	80.9
	College Canteen	137..0	122.8	198.5	127.0	109.9
	Food Sale Counters	116.6	180.8	190.7	124.0	109.3
	Hospitals	134.7	74.4	127.6	187.9	67.4
	Desirable limits – 250- 1000 mg/liter					
3	**Average Sodium Value of Water**					
	Hostel	38..0	25..0	26..0	21.4	50.5
	College Canteen	22.6	32.1	26.3	32.1	34.2
	Food Sale Counters	17.5	26.7	35.5	27.1	21.4
	Hospitals	29..0	21..0	31.8	29.3	29.8
	Desirable limits – 400-600mg/liter					
4	Average Fluoride Content					
	Hostel	0.61.	0.72	0.70	0.49	0.90
	College Canteen	0.52	0.74	0.60	0.62	0.55
	Food Sale Counter	0.89	0.50	0.85	0.73	0.86
	Hospital	0.99	1.17	1.06	1.30	0.39
	Desirable limits – 1.0-1.5 mg/liter					