IMPACT OF DRINKING WATER QUALITY ON THE HEALTH OF CITIZENS OF AMRAVATI CITY (MAHARASHTRA)

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ABSTRACT

Freshwater is an indispensable need of a man and without it no life can exist. Today clean water has become a precious commodity and its quality is threatened by numerous sources of pollution. Water samples from various sources like wells, tube wells, hand pumps, tap water, stored water in cement tanks of schools, colleges, hospitals, municipal office, government offices, commercial markets, lakes and nallahas of Amrvati city. It was found that the drinking water other than tap water & bore water is not suitable for drinking and domestic purposes due to high concentration of total dissolved solid and hardness. The concentration increases during monsoon and premonsoon session and also gets polluted due to various reasons resulting into water borne diseases like diarrhea, dysentery, gastro intestinal disorders, typhoid, paratyphoid, hepatitis and cholera to the human beings.

The present work on drinking water quality of Amravati city and its effects on the human health was undertaken with a view to assess the suitability of drinking water from various sources and awareness about hygienic conditions and preventive measures to be undertaken to maintain the quality of drinking water.

Introduction

Fresh water is an in dispensable need of a man and without it no life can exist for urban dwelling, the water for drinking purposes has several sources like open well water, tube wells, hand pumps and municipal water supply (tap water) through water supply scheme. Though proper care is taken to maintain the standard of water for drinking purposes ((WHO 1971), still due to domestic sewage, industrialization, soil erosion and unhygienic conditions the drinking water may get polluted inviting several water borne diseases affecting the human health.

The study of water pollution due to various pollutants has made greater attention in recent years (Kodarkar 1992, Meshram 1996, Khanna 1993, Gupta & Gupta 1999, Mishra & Patel, 2002, Ade 2001, Khakade et al (2001). More recently Beena et al (2001) have brought to the light of the physic-chemical characteristics of drinking water of well, bore well & tap water of Moothakunnau Maliankara are of Ernaculum. The microorganism present in water plays an important role as biological indicators of water quality (WHO, 1971) & Coli is one of the most among them and is used an index of faecal contamination. The choice and coli form as index organisms is related to sanitary quality of water (Clark 1969, Dufour, 1983, Malik Kalyani, 1994; Narain Rai and Sharma 1995; Cody, 1961; Dutka, 1973).

The purpose of the present investigation was to evaluate the quality of drinking water of Amravati city and its effect on human health.

Materials and Methods

The water samples were collected from the various sources like open wells, tube wells, hand pumps, lakes, tape water, stored water in cement tanks, over head tanks at public places like schools, colleges, hospitals, hostels, municipal office, commercial markets and other govt. offices for the analysis of physic-chemical and microbiological parameters. Physico-chemical properties of drinking water were analysed by using standard method as recommended by APHA (1998).

The microbial examination of water samples were done specially for coliform count, total bacteria and faeeal strepto-cocci

test by using (MPN) method and total bacteria count by using Standard Plate Count (SPC) method as recommended by APHA (1998).

A survey was carried out by giving a questionnaire and also by personal visits to these places for a period of one year. The data was collected with the help of questionnaire and analyzed by computer for assessment of drinking water quality and its effects on human health.

Result and Discussion

The physico-chemical and microbiological analysis of drinking water of different sampling stations of Amravati city particularly from the open wells, tube wells, hand pumps, tape water, water reservoirs (lakes) around the city and also from the public places like schools, college, hospitals, commercial places and govt. offices indicates that the water other than tap- water and tube well water is not suitable for drinking and domestic purpose due to high total solids (TDS) and hardness. The microbiological study of water samples of different sampling stations indicates that except bore well, hand pumps and tap-water, all other sources of water containing high concentration of coliform. The highest number of coliforms can be favours the growth of bacterial population. Our results are well in agreement with Gnana and Johnson (1998); Beena et al, (2002). The presence of pathogenic microbiological organisms are responsible for causing the different types of water bone diseases like diarrhea dysentery, gastrointestinal disorders, typhoid, paratyphoid, hepatitis and cholera to the human beings. Our observations are well in agreement with earlier workers (Dafaur, 1983, Clark 1969, Sharma and Mathur, 1994, Cody, 1961, Malik Kalyani, 1994; Narain Rai and Sharma, 1995; Sharma et al, 1997).

There are some communicable diseases like scabies and trachoma transmission of which is favoured by chronic water storage or poof quality of water. Development of slums area in periurban areas leads to the serious unhealthy sanitation and hygienic problems. The water also gests spoiled due to improper storage of overhead tanks at public places resulting in to wide spread recurrence of epidemics of water borne diseases specially in developing country like India. These findings are well in agreement with earliar workers (Rao, 1994; Parashar, 1992; Beena et al, 2001).

The main source of drinking water for urban population is the dam unit across the river but no river in India is free from pollution (Mahadevan and Krishna Swamy, 1983, Mohan & Reddy 1995, WHO Report 1998). Amravati City receives water from upper wardha river dam after purification at the water treatment plant located at Mardi Road near Amravati University campus. The method used for purification of water are aeration, filtration and chlorination etc. Still there are several reports which reflects the bad condition of drinking water at certain places of urban and periurban area of Amravati city which may be due to mechanical damage of pipelines at some places that results in to percolation of pollutants and microorganisms from the surrounding unhygienic conditions particularly in the slum area of Amravati city which is also in agreement with Rao (1994), Dutka (1973). Hence, the water supplied through underground pipeline (tap water) may not be pure as per the standards prescribed by standard institute ISI (1991), WHO (1971, 1993), ICMR (1975), NEERI (1986).

Chorine in water can form several toxic compounds with thiocyanate, parathion, phenols and Ammonia. It has got synergistic effects with low pH. The water hardness is one of the major determinants of the toxicities of several heavy metals and trace metals. The industrial waste have the greatest potential for polluting the receiving drinking water containing heavy metals and trace metals.

Table-1: Water quality guidelines for Domestic uses

Substance characteristic	Undesirable effect to human body	ICMR (1975)		WHO (1993)	High Tech. Misc. (1986) acceptable	Rejected	Indian Standard	
		A	B				DL	EL
TDS (mg/l)	Gastrointestinal irritation	500	1500	1000	500	15000	500	3000
EC (u mhos/cm)	Gastrointestinal irritation	800	2400	1600	800	2400	800	2400
pH	Taste, corrosion scale formation	7.0-8.5	6.5-9.2	9.5-8.5	7.5-8.5	8.5-9.2	6.5-8.5	9.2
Total Hardness mg/l	Taste and scale formation	300	600	300	200	600	300	600
Ca (mg/l)	Taste and scale formation	75	200	--	75	200	75	200
Mg (mg/l)	Gastrointestinal irritation	50	100	--	300	150	30	100
Cl (mg/l)	Taste	200	10000	250	200	1000	250	1000

A : Limits of general acceptability, **B** : Max. allowable limit, **DL** : Desirable limit
EL : May be extended in absence of alternation source.

Table-2: Annual Mean values of Physico-chemical parameters of different sampling stations of Amravati City.

Parameters / Station	Well water	Bore water	Hand pump	Tap water	Cement tank	Wadali lake	Chattri lake
W.T. (^{0}C)	26.94	26.85	26.83	26.64	30.68	28.57	26.77
pH	7.98	7.63	7.38	7.60	8.36	8.43	8.55
Cond.	53.60	49.83	35.63	53.08	72.05	155.93	201.65
Turb (ITU)	23.01	15.38	22.83	16.93	37.73	57.48	70.63
DO mg/lit	7.75	4.48	4.43	7.46	6.21	8.86	8.26
Free CO_2 m/l	5.99	5.98	6.26	4.66	4.31	2.46	0.15
TDS mg/l	583.23	121.05	170.15	252.78	724.35	415.25	479.41
T. hard m/l	378.62	202.03	160.68	187.28	386.44	215.58	270.33
P. Alkl mg/l	58.51	57.68	56.79	56.61	61.38	38.87	43.87
T. Alkl mg/l	307.37	321.00	279.35	272.38	259.86	160.83	211.47
$CaCO_3$ m/l	185.42	187.88	135.48	176.75	197.39	143.25	135.92
Ca m/l	72.53	74.45	72.62	65.88	82.06	75.38	49.45
Mg mg/l	74.08	30.49	25.20	23.16	44.09	32.68	46.90
Cl mg/l	44.09	98.60	125.58	38.38	145.58	53.23	43.78
SO_4 mg/l	0.69	0.59	3.31	0.73	0.92	23.71	17.04
PO_4 mg/l	0.28	0.28	0.30	0.30	3.50	0.62	0.27
NO_3 mg/l	0.81	0.70	0.66	0.79	0.44	0.20	0.28

W.T. (^{0}C) : Water temperature, **Cond.** : Conductivity, **Turb** : Turbidity (ITU),
DO : Dissolved oxygen, **CO_2** : Carbondioxide, **T.D.S.** : Total Dissolved Solids,
T. hard : Total Hardness, **P. Alkl** : Phenophthelenin alkalinity, **T. Alkl** : Toal alkalinity,
$CaCO_3$: Calcium hardness as calcium carbonate, **Ca** : Calcium hardness as calcium,
Mg : Magnecium, **Cl** : Chloride, **SO_4** : Sulphate, **PO_4** : Phosphate, **NO_3** : Nitrate.

Excess concentration of these heavy metals and trace metals in drinking water causes harmful toxic effect to human beings as well as animals (Dandoroff, 1951; Jenkins & Russell, 1994; Sharma et al, 1997; Panda and Sahu, 2002).

The drinking water quality standards and analysed values are shown in Table-1 and Table-2 respectively.

There is every need to evolve more effective mechanism involving concerned citizens and voluntary organization, is one of the indicators of the effectiveness of the development measures being taken for the welfare of the people. Effective measures for eradication and the control of infectious water borne pathogenic and parasitic diseases by establishing the Center for Prevention and Control of Disease (CPCD) in these areas is required.

Coordination between the policy makers and the common public should be given due considerations in planning water resources management. Protection and management of water bodies have been recognized as a priority sector all over the world, since the quality of potable water plays an important role for the welfare of the public health.

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