

## WATER QUALITY INDEX ASSESSMENT OF DEVOTEE PLACES IN AMRAVATI REGION

\*Tambekar DH and Ahir MR

Department of Microbiology, Sant Gadge Baba Amravati University, Amravati – 444602, India.

### ABSTRACT

In many religions, water has transformative power, from concepts of sin and defilement to purity and participation in the divine. Logically and practically, as a consequence the water that cleanses the devotee becomes polluted by spiritual impurity or physical defilement. The poor quality water is supplied in these religious places may produce the waterborne diseases which is the leading causes of morbidity and mortality in developing countries and around 2.2 million people die every year due to basic hygiene related diseases like gastroenteritis, diarrhoea, typhoid, and dysentery. On the background of above information we decided to assess the water quality index of devotee palaces in Amravati region. A total of 937 water samples were collected from various religious places such as Hindu temples, churches, Gurudwaras, Buddha monastery, Muslim Masjids etc. and were analyzed for its potability and WQI. Over all 60% water is found to be unfit or contaminated with coliform and 31% content faecal coliform or TTC. Only 31%, 4% water was good to medium whereas 19% to 1% was poor to very poor for drinking water purpose. Almost every religious places water was 30 to 83% contaminated with coliform and 17% to 41 % content faecal coliform and only 4% good and 78% medium WQI indicating poor quality of drinking water in religious places.

**Keywords:** Religious places, Water quality, WQI, Amravati region.

### INTRODUCTION

In many religions, water has transformative power, from concepts of sin and defilement to purity and participation in the divine. Holy water is unique with regards to beliefs concerning purity and pollution. Logically and practically, as a consequence the water that cleanses the devotee becomes polluted by spiritual impurity or physical defilement. Ritual purification with water involves a process wherein an individual devotee purifies him or herself by polluting the holy both spiritually and physically. Water has a central place in the practices and beliefs of many religions for several reasons. Firstly, water washes away impurities and pollutants and it can make an object look as good as new and wipe away any signs of previous defilement [1]. Millions of people all over the world, particularly in the developing countries are losing their lives every year from water borne diseases [2,3]. The quality of water is of vital concern for mankind since it is directly linked with human welfare [4].

Sulabha and Prakasam [5] reported that Sree

Mahavishnu temple pond water mainly contaminated with coliform bacteria. Khalifa *et al* [6] showed bad bacteriological quality of drinking water provided for worshipers by Mosques in Tripoli. Bassam and Mashat [7] analysed 86 samples of Sabil water and conclude that total viable bacterial count, coliform bacterial count and *E.coli* were beyond the limit. Tambekar *et al* [8] observed that the waterborne diseases are among the leading causes of morbidity and mortality in developing countries and around 2.2 million people die every year due to basic hygiene related diseases like gastroenteritis, diarrhoea, typhoid, and dysentery. Kumar *et al* [9] stated that water quality condition and assessment of individual water quality variables influence on water resources policy; the general public and policy makers. Jayashankar *et al* [10] noted that the microbes in freshwater quite often change its quality and render it unfit for human use. Kishore and Hanumantrao [11] explored the physicochemical characteristics of drinking water sources of Tippiarthy revenue sub-division, Nalgonda (District), Andhra Pradesh,

India and observed that chemical constituent was beyond the permissible limits. Rajankar *et al* [12] reported that only 19% groundwater fit for domestic use and indicating the need of proper treatment before use. Raju and Damodharam [13] stated that the water quality Tirumala and Tirupati, was not fit for drinking purpose. Tambekar and Neware [14] reported that the drinking water is an important resource that needs to be protected from pollution and biological contamination. Hence, unhygienic practices must be stopped to prevent spread of faeco-oral diseases among human beings due to contaminated water.

Amravati region is the mixture of very religions and cultures. There are *Hindus, Buddhism, Muslims, Sikhs, Jains, Christian* etc. There are many people in society who believe in God and their Goddess and drink the water available in devotee palaces. Since they can't effort to use package drinking water and poor quality water is supplied in such of the places so afford they have to depend on such unsafe source of water. In the background of above information we decided to access the water quality index of devotee palaces in Amravati region.

## MATERIALS AND METHODS

### Collection of Water samples from Amravati Division

A total of 937 water samples were collected from various religious places such as Hindu temples, churches, Gurudwaras, Buddha monastery, Muslim Masjids etc. and were analyzed by employing each of the test mentioned below.

### Physico-chemical Examination of Water

Various physico-chemical parameters like temperature, pH, Turbidity (NTU), alkalinity, total hardness, Nitrate (NO<sub>3</sub>-), Phosphate (PO<sub>4</sub>-3), BOD and COD were determined following standard methods. Sampling and physico-chemical investigation was carried out according to standard methods [15,16].

- Water temperature - Recorded in the field using sensitive mercury thermometer.
- The pH - Determined using digital pH meter.
- Turbidity -Determined by Nephelo – turbidity meter.
- Total Hardness - Determined titrimetrically using EDTA method.
- Total Alkalinity -Determined by titrimetrically method.
- BOD - Determined as per standard method.
- COD -Determined by potassium dichromate open reflex method.
- Nitrate and Phosphate- Determined as per standard method.

**Bacteriological Analysis:** A total of 937 water samples were collected from different devotee places in Amravati region analyzed by various tests such as H<sub>2</sub>S, MPN, Eijkman's test (TTC) for its potability.

**MPN Method:** In the most probable number (MPN) method, the 3 sets of test tubes containing 10mL double strength MacConkey broth in which 10mL water sample was added. Another six test tubes containing 10mL single strength MacConkey broth each, out of these 6 test tubes 3 test tubes were inoculated with 1mL water sample and another 3 test tube were inoculated with 0.1mL water samples. Then all tubes were incubated at 37<sup>o</sup>C for 24h. The production of acid and gas in Durham's tube indicate positive results. All MPN positive tubes were further preceded for Eijkman test for detection of thermo-tolerant *Escherichia coli*.

### Detection of water quality by H<sub>2</sub>S Method and Eijkman Methods

Blackening in H<sub>2</sub>S medium was recorded after 24 and 48 h of incubation at RT (room temperature) and at 37<sup>o</sup>C is positive test. Only MPN positive water samples were further inoculated for Eijkman test in BGLB (Brilliant Green Lactose Bile) medium at 44.5<sup>o</sup>C for 24 h and positive results were recorded as gas in BGLB and indole positive at 44.5<sup>o</sup>C (APHA 2012).

## RESULT AND DISCUSSION

In the present study a total no. of 937 water samples were collected from devotee places in Amravati region out of which 171, 183, 203, 126 and 254 water samples were collected from devotee places in Akola, Amravati, Buldhana, Washim and Yavatmal district respectively. In all 725 water samples were collected from Hindu devotee places, 102 water samples were collected from Muslim devotee places, whereas no. of water samples collected from Buddha, Jain, Christian and Sikh devotee places were 45, 37, 16 and 12 respectively. With respect to the type of source of sample, out of total 937 samples 331 samples were collected from earthen pots, 194 samples were collected from water storage tank, 87 samples from hand pump and 79 samples from dug well. Furthermore no. of samples collected from tap water, tube water, water cooler, steel container, serve water and Gaumukh were 77, 52, 51, 46, 12 and 8 respectively. Classification of samples with respect to district, religious place and type of source is shown in Table-1.

Following Table 2 demonstrates percentage quality of water available at various devotee places in the districts of Amravati region. It was observed that water quality index of majority of water samples collected from devotee places of different districts in Amravati region was medium (77.8%), whereas 30.6% samples were TTC positive and 60% samples were H<sub>2</sub>S positive after 72 h.

Over all 60% water is found to be unfit or contaminated with coliform and 31% content faecal coliform or TTC. Only 31%, 4% water was good to medium whereas 19% to 1% was poor to very poor for drinking water purpose. Almost every religious places water was 30 to 83% contaminated with coliform and 17%

to 41 % content faecal coliform and only 4% good and 78% medium WQI indicating poor quality of drinking water in religious places (Table-2 and Fig.1)

In addition to this 83.3% water samples collected from Sikh devotee places were H<sub>2</sub>S positive after 72 h, 41.2% samples collected from Muslim devotee places were TTC positive and 87.5% and 6.3% samples collected from Christian devotee places were indicating medium and very poor quality index.

Moreover, 40.5% and 69.9% and 82.3% water samples collected from well were H<sub>2</sub>S positive at 24 h, 48H and 72 h respectively. 55.7% well water sample were TTC positive. It was also observed that 25% samples collected from Gaumukh at devotee place were indicating good water quality index, 88.5% tube well water samples indicated medium water quality index, 30.4% well water sample indicated poor water quality index and 8.3% samples collected from served water indicated very poor water quality index.

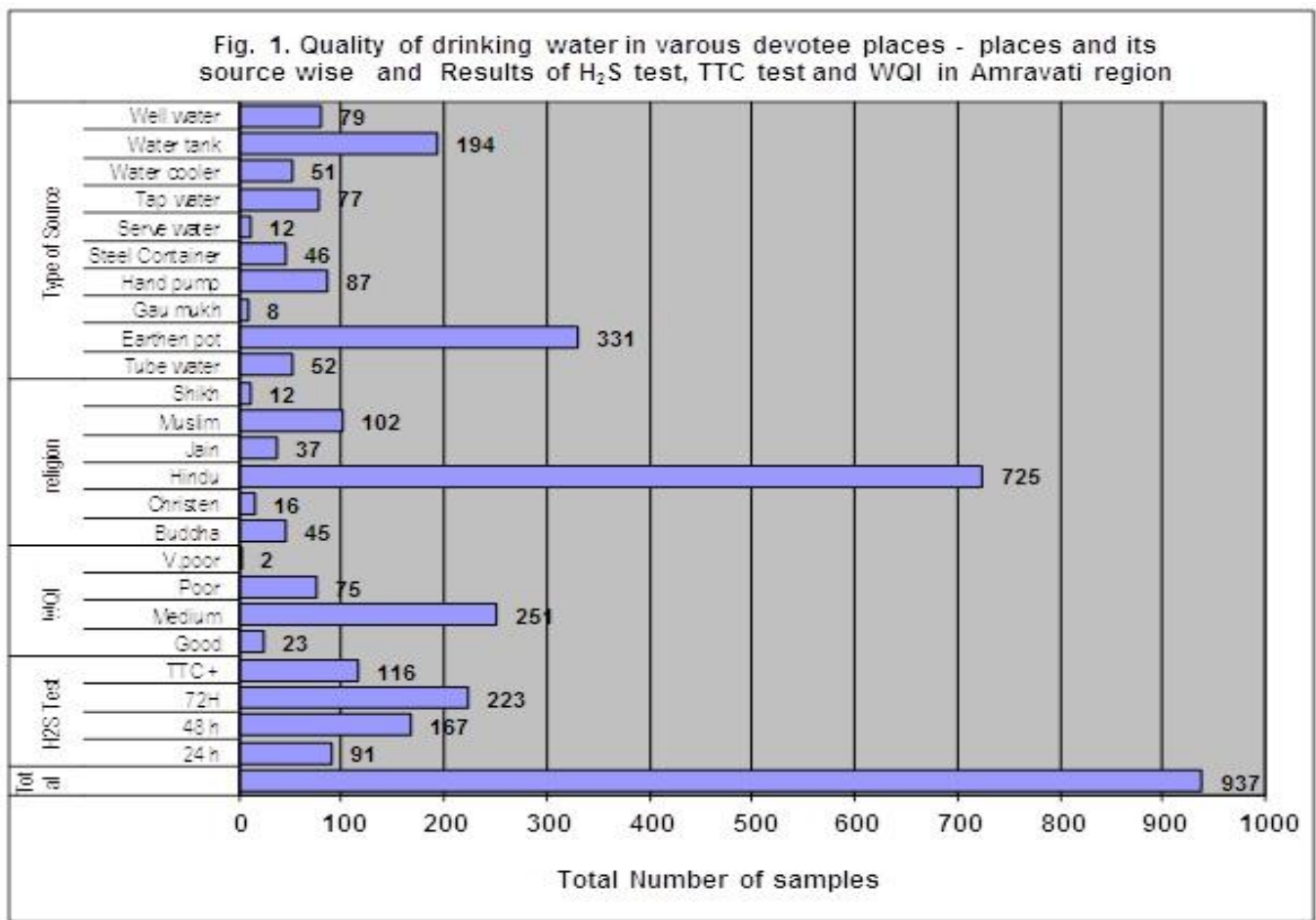
**Table 1. Quality of water in Amravati region (district wise), at various religious places and from various sources**

	Type	Total Water samples	H <sub>2</sub> S 24 Positive	H <sub>2</sub> S 48 Positive	H <sub>2</sub> S 72 Positive	TTC Positive	WQI			
							Good	Medium	Poor	very poor
District	Akola	171	36	78	104	52	6	128	34	3
	Amravati	183	32	74	103	51	10	141	31	1
	Buldhana	203	31	84	120	60	4	169	29	1
	Washim	126	27	52	72	45	2	100	22	2
	Yavatmal	254	60	111	163	79	14	191	48	1
	<b>Total</b>	<b>937</b>	<b>186</b>	<b>399</b>	<b>562</b>	<b>287</b>	<b>36</b>	<b>729</b>	<b>164</b>	<b>8</b>
religion	Buddha	45	3	16	30	11	4	34	7	0
	Christen	16	3	5	10	3	1	14	0	1
	Hindu	725	148	316	433	221	23	573	123	6
	Jain	37	2	10	13	8	5	24	8	0
	Muslim	102	28	44	66	42	3	73	25	1
	Shikh	12	2	8	10	2	0	11	1	0
	<b>Total</b>	<b>937</b>	<b>186</b>	<b>399</b>	<b>562</b>	<b>287</b>	<b>36</b>	<b>729</b>	<b>164</b>	<b>8</b>
Type of Source	Tube water	52	4	15	28	9	1	46	5	0
	Earthen pot	331	74	148	211	106	7	259	65	0
	Gaumukh	8	0	2	2	1	2	6	0	0
	Hand pump	87	7	33	50	16	3	74	10	0
	Steel Container	46	1	10	21	7	3	40	3	0
	Serve water	12	3	5	6	4	0	10	1	1
	Tap water	77	11	30	39	18	5	62	10	0
	Water cooler	51	6	11	17	8	10	37	4	0
	Water tank	194	48	90	123	74	3	148	42	1
	Well water	79	32	55	65	44	2	47	24	6
	<b>Total</b>	<b>937</b>	<b>186</b>	<b>399</b>	<b>562</b>	<b>287</b>	<b>36</b>	<b>729</b>	<b>164</b>	<b>8</b>

**Table 2. Percent Quality of water in Amravati region (district wise), at various religious places and from various sources**

	Type	H <sub>2</sub> S 24 Positive	H <sub>2</sub> S 48 Positive	H <sub>2</sub> S 72 Positive	TTC Positive	WQI			
						Good	Medium	Poor	very poor
District	Akola	21%	46%	61%	30%	4%	75%	20%	2%
	Amravati	18%	40%	56%	28%	6%	77%	17%	1%
	Buldhana	15%	41%	59%	30%	2%	83%	14%	1%
	Washim	21%	41%	57%	36%	2%	79%	18%	2%
	Yavatmal	24%	44%	64%	31%	6%	75%	19%	0%
	<b>Total</b>	<b>20%</b>	<b>43%</b>	<b>60%</b>	<b>31%</b>	<b>4%</b>	<b>78%</b>	<b>18%</b>	<b>1%</b>
religion	Buddha	7%	36%	67%	24%	9%	76%	16%	0%
	Christen	19%	31%	63%	19%	6%	88%	0%	6%
	Hindu	20%	44%	60%	31%	3%	79%	17%	1%
	Jain	5%	27%	35%	22%	14%	65%	22%	0%

	Muslim	28%	43%	65%	41%	3%	72%	25%	1%
	Shikh	17%	67%	83%	17%	0%	92%	8%	0%
	<b>Total</b>	<b>20%</b>	<b>43%</b>	<b>60%</b>	<b>31%</b>	<b>4%</b>	<b>78%</b>	<b>18%</b>	<b>1%</b>
Type of Source	Tube water	8%	29%	54%	17%	2%	89%	10%	0%
	Earthen pot	22%	45%	64%	32%	2%	78%	20%	0%
	Gaumukh	0%	25%	25%	13%	25%	75%	0%	0%
	Hand pump	8%	38%	58%	18%	3%	85%	12%	0%
	Steel Container	2%	22%	46%	15%	7%	87%	7%	0%
	Serve water	25%	42%	50%	33%	0%	83%	8%	8%
	Tap water	14%	39%	51%	23%	7%	81%	13%	0%
	Water cooler	12%	22%	33%	16%	20%	73%	8%	0%
	Water tank	25%	46%	63%	38%	2%	76%	22%	1%
	Well water	41%	70%	82%	56%	3%	60%	30%	8%
	<b>Total</b>	<b>20%</b>	<b>43%</b>	<b>60%</b>	<b>31%</b>	<b>4%</b>	<b>78%</b>	<b>18%</b>	<b>1%</b>



### CONCLUSION

A total of 937 water samples were collected from various religious places such as Hindu temples, churches, Gurudwaras, Buddha monastery, Muslim Masjids etc. and were analyzed for its potability and WQI. Over all 60% water is found to be unfit or contaminated with coliform and 31% content faecal coliform or TTC. Only 31%, 4%

water was good to medium whereas 19% to 1% was poor to very poor for drinking water purpose. Almost every religious places water was 30 to 83% contaminated with coliform and 17% to 41% content faecal coliform and only 4% good and 78% medium WQI indicating poor quality of drinking water in religious places.

**REFERENCES**

1. Bhuyan B, Kakati SS and Sarma HP. Chemical quality of water and health effects of Drinking water contaminants in and around the tea Gardnes of Lakhimpur district. *Assam. Poll. Res*, 25(3), 2006, 571-575.
2. CCME, Canadian Council of Ministers of the Environment. Canadian water quality guideline for the protection of aquatic life CCME water quality index. 1.0 Technical Report, 2001, 1-4.
3. Special report on India, SRI. Creaking, groaning: Infrastructure is India's biggest handicap. *The Economist*, 2008, 1-5.
4. Adefemi OS, Asaolu SS and Olaofe O. Assessment of the physicochemical status of water samples from major dams in Ekiti state Nigaria. *Pakistan J. Nutrition*, 6(6), 2007, 657-659.
5. Sulabha V and Prakasam VR. Limnological features of Thirumullavaram temple pond of Kollam municipality, Kerala. *J. of Environ. Biol*, 27(2), 2006, 449-451.
6. Khalifa S, Khalifa B, Algau A, Alturki E, Rahouma A and Abeid S. Bacteriological Quality of Drinking Water Obtained from Mosques in Tripoli, Libya, 2007, 3-5.
7. Bassam HH and MN Mashat. The Microbiological Quality of Sabil (Free) Drinking water in Makkah Al-Mukarramah during Ramadan 2007. JKAU: Met. *Environ. Arid Land Agric. Sci*, 21(2), 2007, 87-100.
8. Tambekar DH, Waghode SM, Ingole SG and Gulhane SR. Water Quality Index (WQI), Analysis of the Salinity- Affected Villages from Purna River Basin of Vidarbha Region. *Nature Environment and Pollution Technology*, 7(4), 2008, 707-711.
9. Kumar SD, Sudhakar B, Krishna SV, Rao PV and Sekhar MC. Determining water quality index for the evaluation of water quality of river Godavari. *International J. of Engineering Research and Applications*, 1(2), 2008, 174-182.
10. Jayashanakara M, Vijaya R, Shankar PG and Hosmani. Microbial Diversity and Water Quality Index in Temple Ponds of Udupi District, Karnataka, India. *Nature Environment and Pollution Technology*, 9(1), 2010, 197-202.
11. Kishore M and Hanumantharao Y. Assessment of Water Pollution in Tipparthy Revenue Sub-Division, Nalgonda (District), Andhra Pradesh. *India. J. of Chemistry*, 7(1), 2010, S587-S593.
12. Rajankar PN, Tambekar DH, and SR Wate. Groundwater quality and water quality index at Bhandara District. *Environ. Monit Assess*, 179, 2011, 619-625.
13. Raju K and Damodharam T. Water Quality monitoring on Tirumala and Tirupati, Andhra Pradesh, India. *Der Pharma Chemical*, 4(3), 2012, 1074-1079.
14. Tambekar DH and Neware BB. Water Quality Index and multivariate analysis for groundwater quality assessment of villages of rural India. *Science Research Reporter*, 2(3), 2012, 229-235.
15. APHA. Standard methods for the examination of water and wastewater, 22<sup>nd</sup>edn, American Public Health Association, 2012.
16. National Environmental Engineering Research Institute, NEERI. Guidance Manual for Drinking Water Quality Monitoring and Assessment, Nagpur and NICD, Delhi, 1991, 10, 1-9.