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Drinking water quality deterioration in hostels in Amravati city

KEYWORDS

Contamination, Drinking water, Hostels, Hygiene, Waterborne diseases)

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ABSTRACT

As a result of rapid and huge increase in education, limits the hostel facilities in city, and leads inadequate supply of pure and safe potable water to the hostels. As the number of students is increasing, there is strain on hostels to maintain the hygienic condition and increases the chances of deterioration drinking water during collection, storage, serving and handling. Therefore, the purpose of the study was to assess the quality of drinking water in hostel in Amravati city. A total of 118 water samples were tested for its potability by Manja's rapid field test (H_2S) and recorded only 57% potable by H2S test. The Eijkman's test showed 30% fecal coliform (*E.coli*) in the 43% non-potable water. The study concludes that drinking water in most of the hostels is unfit for drinking purpose and need attention and monitoring of drinking water hygiene by concern authority so that students can be protected from waterborne diseases. Regular cleaning of storage container or overhead tank is must with supply of treated and disinfected water. This study recommended that closed container with tap must be used for storage of drinking water and if possible purifier should be used which prevents waterborne diseases in hostels students by increasing awareness and maintaining hygienic condition of hostels and surrounding.

INTRODUCTION

Water is the most common and important resource on the earth, without which there would be no life. Potable water does not contain any pathogen in concentration that could cause illness in any form. But often, various drinking water quality parameters set by WHO are frequently violated and poorly managed and monitored (WHO, 1993; 2005). Good quality drinking water can be polluted in several ways of which faecal and soil pollution are the most important with respect to microbial agents. Microbial and chemical pollutants are the main factors responsible exclusively or in combination for various public health problems (Azizullah, 2011). Water is the vector of transfer of the enteric pathogens such as *Vibrio cholera, E-coli and Salmonella typhi* and can caused cholera, typhoid, dysentery and hepatitis (WHO, 2009). In developing countries water pollution is one of the major threats to public health and over one lakh people die of waterborne diseases annually in India, (WHO, 2013; Ojiegbe, 2005).

The Amravati city is one of the educational hubs of Vidharbha and there are number of students and working people hostels for their residential. There are many hostels in Amravati which are run by Government, semi-government, Private, NGO and Working people's agencies. These hostels have different sources for drinking water such as open well, tube-well and MJP. As the number of students is high, there is strain on hostels to maintain the proper hygieneic condition which increases the chances of contamination of drinking water during collection, storage, serving and handling. Human activities like improper disposal of hostel and mess effluents and indiscriminate applications of unhygienic surrounding are also the main factors contributing to the deterioration of water quality in hostels. The potable water can easily be contaminated by incorrect method of storage or withdrawing or dipping directly dipper or the hand/fingers which leads to infection in students and may affect their health and education (Tambekar et al., 2006; Gugwad *et al.*, 2012).

Thus, the poor hygiene such as improper method of storage, handling and serving deteriorates the quality of drinking water which can be improved by imparting water hygiene behavior and awareness in sanitation (Tambekar *et al.*, 2016; Thompson *et al.*, 2003). Therefore, drinking water facility must be monitored regularly for the betterment of health of students. The aim of the present study was to assess the quality of drinking water in the hostel. The study was also design to find out the probable cause of contamination in drinking water in hostels so that by applying proper interventions the water can be protected from contamination, this will help in improving the health of students and the people, living in the hostels.

MATERIALS AND METHODS

A detailed study was conducted by collecting water samples from hostels (Government, semi-government, Private, NGO, Working peoples) in Amravati (Maharashtra) to observe the potability of drinking water. The overall study was based on observation and information collected while the survey on basis of detailed questionnaire prepared. The collected data was analyzed by using SPSS software (SPSS version 16.0vv for windows) for finding out the possible cause of drinking water contamination.

The drinking water samples were collected in 50 mL screw cap bottle containing 01mL of modified H2S medium (Manja *et al.*, 2001) sterilized at 121^{o}C for 15 min. To each 50 ml bottle, 20ml drinking water sample was added for testing its potability and incubated at 370C for 24h to 72h. The nonpotable water samples were further processed for the presence of thermotolerant/ fecal *E.coli* by Eijkman test by subculturing in brilliant green lactose bile broth (BGLB) and tryptone water broth for acid gas and Indol production at 44.50C. All the bacteriological media were obtained from Hi-media pvt Ltd, Mumbai, India, (APHA, 2012).

RESULTS AND DISCUSSION

A total of 118 water samples from 66 different hostels were tested for its potability and showed that 51 (43%) were non-potable and 67 (57%) potable. It is observed that 30 (46%) hostels served non potable whereas 36 (54%) hostels served potable water to students. The thermotolerant *E.coli* were detected in 36(30%) water samples of 17(26%) hostels out of total 66 hostels and 118 water samples (Table 1).

Table 1. Quality of drinking water in hostels

	Total	Rapid field test			TTC Positive	Potable	Non potable
		24h	48h	72h			
Hostels	66	4(6%)	17 (26%)	30 (68%)	17 (26%)	36 (54%)	30 (46%)
Water Sample	118	06 (5%)	27 (23%)	51 (43%)	36 (30%)	67 (58%)	51 (42%)

The analytical data showed that drinking water of the government

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hostels were most contaminated (80%) compare to NGO, working peoples, semi government hostel and private hostels. The thermotolerant coliform was found in 19 sample of government hostel out of 29 non potable sample and 49 total samples. In the samples obtained from semi government 17 samples was non potable and thermo tolerant coliform found in 14 samples (Table.2).

Table.2: Quality of drinking water in hostels

Type of Hostel	Hostel	Sample	Rapid Field Test			Potability				
			24h	48h	72h	TTC +ve	Potable		Non-potable	
							Hostel	sample	Hostel	Sample
Government	25	49	04	15	29	19	10	20	15	29
Semi Govt.	29	45	02	08	17	14	17	28	12	17
Private	09	20	00	04	05	03	06	15	03	03
NGO	01	02	00	00	00	00	01	02	00	00
Working People	02	02	00	00	00	00	02	02	00	00
Total	66	118	06	27	51	36	36	67	30	51

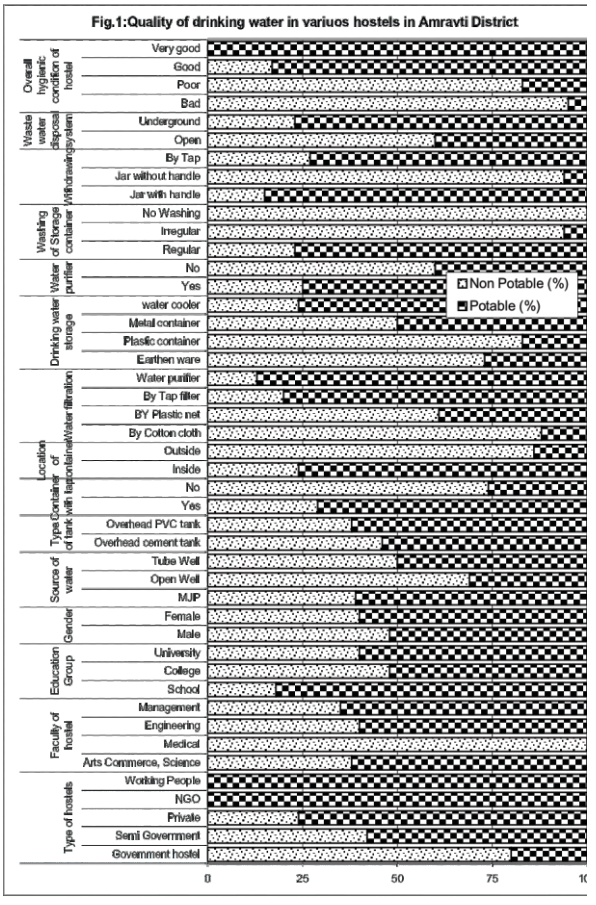
The study showed that drinking water in medical collages hostel was 100% nonpotable whereas in arts, commerce and science, engineering and management college hostel's it was between 35 to 40%. The 18% contamination was recorded in school's hostel as compare to 48% in college and 40% in university hostels. The study indicated that drinking water was most contaminated (69%) when the source was open well whereas that of (39%) MJP. Regular cleaning of overhead tank is essential, where washing is irregular or no washing 61% and 100% nonpotable water was found and whereas only14% contamination recorded regular washing.

The methods of filtration also affect the quality; the water filtered by plastic net contaminates 61% whereas 13% when water purifier was used. The plastic and earthen container contaminate the water more (83% and 73%) as compare to the water cooler (24%). The reason for least contamination in water cooler may be due to use of tap for withdrawal and it is closed. The frequency of washing of tank also effect the quality of drinking water, it was 20% pollution in water when washing was twice a week as compare to 100% when it was washed 2-3 times in a year. Similarly, Chidavaenzi *et al*., (1998) reported that an uncovered water container is increased water contamination between source and point of use. Withdrawal of water with tap records 29% contamination as compare to 74% in storage container without tap 74%. Site of placement of water also affects the quality of water, the minimum contamination was recorded when it is placed inside as compared to when it placed outside (86%) the building. This may be due to entry of dust into the storage container which contains the microorganisms. Moreover use of jar with long handle (15%) reduces the contamination as compare to without handle (68%). The waste water disposal system and hygienic condition of water storage tank also affect on quality of drinking water. Open waste water disposal system makes the drinking water more (60%) non-potable as compare to underground disposal system. Data showed that the water disposal system should be underground to protect the water. The overall hygienic condition is also responsible for the contamination of water, if over all hygienic condition of hostel was bad then 95 % water contaminated (Fig.1).

Thus study resulted that the quality of drinking water in government and medical college hostels was poor as compare to arts, commerce and science college hostels. It is very serious concern, as the medical collages are the hub of pathogenic microorganism and may affect the health of the medical students. The frequent cleaning of storage container and use of long handle dipper maintained the good quality of water. The source of water must be proved from dust and waste disposal and should be clean, hygienic and free from microbial contamination. Our studies concur with Sohani and Iqbal, (2012) studies in Indore, who recorded considerable deterioration in bacteriological quality of water. Similarly, Tambekar and Neware, (2012), Gundry *et al*., (2004) and Gunther and Schipper (2013) studied that the importance of education, socio-cultural acceptance, changing people's beliefs and behaviors achieved sustainability and affordability is the provision of safe water. Unsanitary methods to dispensing water from storage vessels, including contaminated hands and dippers, and inadequate cleaning of vessels, which lead to accumulation of sediments and pathogens. The use of long handle dipper, improvement in hygienic behavior, awareness on water born diseases, and protecting or covering of water storage container prevents the contamination of the water.

CONCLUSION

The study concludes that maintaining the quality of drinking water in the hostel is necessary for the healthy future of the students. The quality of drinking water in government and medical college hostel was poor and need to improve sanitation by the concern authority to protect the students from waterborne diseases. The overhead tank or other, regular cleaning is must and it should be monitored timely. The water for drinking from the unprotected, open well should be avoided. The supply of treated and disinfected water should be preferred. The study recommended that the water container should be closed and with tap and if possible purifier should be used. Use of long handle dipper also helps in maintaining the water potable. Maintaining hygienic condition of hostel and surrounding by increasing awareness about the waterborne diseases prevents the contamination of hostels drinking water. Thus it needs to increase the hygienic behavior to prevent water borne diseases. Thus, poor hygiene behaviors such as improper method of storage, handling and serving, deteriorates the quality of drinking water which can be improved by imparting water hygiene behavior education.



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