



Research Article

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Bacteriological studies of drinking water from Lonar town of Buldhana district of Maharashtra

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ABSTRACT

Water is an essential constituent of all animals, plants and human beings. Different sources of water like rain water, river water spring water and mineral water meet requirement of each living organisms. Inspire of abundant water resources, 1/3rd population has to depend on drinking water scarcity, is always a burning problem. Many catchments areas do not have sufficient water for drinking purpose is very much limited as compared to its consumption. Water can be distributed and water scarcity problem can be resolved to some extent. The people from interior of Buldana district of Maharashtra state uses well water for their daily activities and also for drinking purpose. Polluted water is responsible for spread of water borne diseases. So it is necessary to analyze the present water. Water resources are poorly managed in the rural areas of Maharashtra. The good quality water supply to such citizens is a need of this century. Due to uneven rainfall during the year, people have to use ground water from bore well. Industrial pollution has further affected the water quality. We have identified some water samples as ten samples from wells, ten water sample from tap water, four water samples from bore wells and four water samples from surface water in the Lonar region and people around it use well water for drinking purpose. A detailed survey on the portability of different water samples, water resources was conducted the presence of E. coli in 85% water samples indicates faecal contaminations which is dangerous and hence which require immediate attention towards the same. So some suggestions have been made for their improvement.

Keywords: Drinking water, Bacterial contamination, Multiple tube method (MPN) coliform.

INTRODUCTION

It is well established that a large number of infectious diseases are transmitted primarily through water supplies contaminated with human and animal excreta particularly faeces. Outbreaks of water borne diseases continue to occur throughout the world but especially serious in developing countries. The human pathogens that present serious risk of disease whenever present in drinking water include Salmonella species, Shigella species, Yersinia enterocolitica, Campylobacter species, various viruses such as Hepatitis A Virus, Hepatitis E Virus, Rota Virus and parasites like Entamoeba histolytica, Giardia lamblia and so on. Keeping in view the importance of safe drinking water, drinking water is routinely examined to ensure safety for drinking in developed countries. It is not practicable to monitor drinking water for every possible pathogen. Therefore, normal intestinal organisms are used as indicator of faecal pollution. These include coliform group of organisms. They are considered as suitable indicators because they are easy to detect and enumerate in water. Multiple Tube Method for estimation of total coliforms and faecal coliforms is a standard test used as indicator of sewage contamination of water supplies. In India, water microbiology is a neglected subject. A few studies have been carried out in different parts of India. These studies

show that bacterial contamination of water is quite high. Present study was carried out to determine the current status of bacteriological quality of drinking water in different areas of Lonar town.

EXPERIMENTAL SECTION

The alkaline Lonar lake is situated in Buldhana District of Maharashtra is the only meteoritic impact crater in basaltic rock with high alkalinity and salinity. Biodiversity of this lake regarding the industrially important enzymes was studied but the bacteriological quality of drinking water in the Lonar town has not been studied so far. In the present study, water samples from piped water supply of Lonar were tested during the months of Sept and Octo 2012. A total of 28 water samples were tested from different localities of Lonar. These localities belonged to areas with high Socio-economic conditions (SEC), Intermediate SEC and Low SEC. Water samples were collected in 200 ml capacity sterilized containers from the household water taps using standard water collection techniques.

These water samples were transported to microbiology lab within two hours of collection. In the laboratory, all the samples were subjected to Multiple Tube Test for determination of most probable number (MPN) of coliforms and faecal coliforms. The test was performed according to standard procedure. The water samples were considered as having doubtful quality. Aseptically, one 50 ml volume and five 10 ml volume water was added to bottles and tubes containing 50 ml and 10 ml each of double strength MacConkey Broth Medium (Oxoid). Additionally five 1 ml volume of water sample was added to tubes containing 5 ml of single strength MacConkey Broth Medium. All the bottles and tubes contained inverted Durham tubes and were pre-sterilized in autoclave.

All the bottles and tubes were incubated at 37°C for 48 hours. The bottles or tubes which showed acid and gas production were considered positive for coliforms. From the distribution of these positive bottles and tubes Most Probable Number (MPN) of Total Coliforms was determined by referring to standard probability table for estimation of Total Coliforms. 18 All the bottles and tubes positive for Total Coliforms were subcultured into 10 ml of single strength MacConkey Broth with inverted Durham tubes and 5 ml of Peptone water to determine presence of faecal coliforms. These tubes were incubated at 44°C for 24 hours. The tubes showing acid and gas and indole production were taken as positive for Faecal Coliforms. (Ejikman Test Positive). From the number of these positive tubes, MPN of Faecal Coliforms was calculated by referring to the table as for Total Coliforms. The samples with MPN of one or more were considered as contaminated while samples with zero MPN were considered free from bacterial contamination according to UK standard for drinking water in the piped water supplies.

RESULTS

A total of 28 water samples were tested from piped water supply system of Lonar in the present study. These were taken from different localities of Lonar including areas with high, intermediate and low SEC. out of 28 samples, 24 (85%) water samples were positive for bacterial contamination.

Table 1: Bacterial contamination among water samples collected from different area of Lonar.

Sr. No.	Water Sample	No. of sample collected	Bacterial contamination		Coliform test			MPN/100ml
			Positive (+ve)	Percentage %	Presumptive test	Confirmatory test	Completed test	
1	Tap water	10	07	70%	07	07	07	18
2	Well water	10	10	100%	10	10	10	16
3	Bore well water	04	03	75%	03	03	03	11
4	Surface water	04	04	100%	04	04	04	21
5	Total	28	24	85%				

DISCUSSION

In the present study an effort was made to assess the bacteriological quality of drinking water in Lonar. According to WHO there should be no coliform bacteria/100 ml of treated water in distribution as tested by multiple tube test. The present study 85% percent water samples were positive for bacterial contamination (unfit for human consumption). This shows that there is a no improvement in the bacteriological quality of drinking water in Lonar over the past years; though not unsatisfactory at all. Present study was carried out in the month of Sept and Octo. However, the figure of 85% percent in the present study is much higher than that of ICMR standards of drinking water.

These findings indicate that over last couple of years there appears to be deterioration in the water supply system in Lonar. It is also observed that there is progressive increase in the frequency of contaminated water samples from different areas of Lonar. Therefore, level of sanitary conditions in the community appears to have inverse relationship with the contamination of water supplies. This finding is in agreement with that observed in a previous study at Lonar. Water in distribution is contaminated during its passage in water pipes. This contamination can occur due to defective joints, back siphonage, rusted pipelines crossing over the sewage pipes and low/ high pressure in the pipelines. Proximity of water pipes to the main sewer pipelines also leads to contamination of water in distribution. Situation of water supply in other parts of India and neighboring countries is also not good. In Pakistan, 60.9% of samples²³ while in Indonesia 45.7% samples were found to be unfit for drinking. In a study carried out in Iran, it was observed that 30.2% of water samples from rural areas were contaminated with bacteria. In Pakistan, 38 to 56.2 percent of water samples in Rawalpindi/ Islamabad have been reported to be bacteriologically contaminated in different studies. These figures are higher when compared to that in the present study. In Karachi, much higher contamination (87%) of tap water samples have been reported.²¹ Similarly high percentage of samples of water were found to be contaminated with fecal *E. coli* in Sukkur city and different districts of Khairpur, Sindh (82% and 100% respectively). All this data indicates that bacteriological contamination of drinking water is a significant problem not only in India but also in other developing countries. Bacteriological contamination of drinking water is a significant problem in other parts of the world also like Sudan (45.2%) and Makkah al-Mokaaarama (31.2-37.5%). Keeping in view the high level of contamination of drinking water in our country, it is essential that water be examined regularly and frequently throughout the year as contamination may be intermittent. At the same time there is need for making the water supplies safe for human use by regular chlorination and taking immediate appropriate remedial measures whenever contamination is observed. It may also be pointed out that even drinking water from water dispensers has also been observed to be contaminated with bacteria. As water coolers are popular in office buildings and commercial stores nowadays, the quality of this source of drinking water also has the potential to cause water borne outbreaks. Therefore, there is a need for adopting appropriate routine monitoring system to prevent or to diminish the chances of contamination of this water source.

CONCLUSION

On the basis of the present study, analysis of water samples of Lonar town in Buldana district of Maharashtra state shows that 85% of water samples have been contaminated within the permissible limits. According to WHO the presence of *E. coli* in drinking water indicates potentially dangerous situation, and require immediate attention. Bacterial contamination is significant problem in Lonar. The results also suggested that the contamination in 24 water samples is alarming and require periodic monitoring of water in the study area as regular monitoring and chlorination/establishment of water filtration plants can improve this situation.

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