

Public drinking water: How safe is railway station water in India? A study

D.H. Tambekar, R.S. Ramteke, S.R. Gulhane, M.S. Wangikar, P.N. Rajankar, M.R. Mogarekar¹

Post Graduate Department of Microbiology

S.G.B. Amravati University, Amravati 444 602 (India)

¹Dept Of Biochemistry, S.R.T.R.Medical College Ambejogai, 431517, (India)

Email: diliptambekar@rediffmail.com

Abstract

In the present investigation, a study on drinking water quality of 43 railway stations on Nagpur - Bhusawal Central railway route in Maharashtra is performed by analysing a total of 160 samples during June to December 2006 for potability of drinking water by standard methods and recorded 24% water was safe whereas 76% samples were polluted. The main stations provides 81% potable water whereas moderate to small stations provided 86% to 95% contaminated or polluted water to the passengers. The main or junction railway station authorities only provided good quality drinking water by maintaining proper water hygienic conditions and neglecting water hygiene at moderate to very small stations. Hence it is recommended that proper water hygienic conditions should be maintained at all levels of collections, storage and distributions of water irrespective of type of railway stations.

Keywords: Railway station water, MPN, quality of water, Water hygiene, public water

Introduction

Water intended for human consumption should be both safe and wholesome. It also should be easily accessible, adequate in quantity, free from contamination and readily available. The major hazard in drinking water supplies is microbial contamination, which is due to agricultural land wash, domestic sewerage, industrial effluents, improper storage and handling [1,2]. Primary contamination in drinking water is mainly due to source of water supply, water storage and leakage of pipes and secondary due to man made such as improper handling, storage, distribution and

serving methods [3]. The potable water can be easily contaminated by incorrect method of storage or by dipping dirty dipper or the finger or by dirty glass, jug etc and causing basic hygiene related diseases, like diarrhea every year [4,5]. More than 250 million cases of water borne diseases are reported each year, resulting in more than 10 million deaths and nearly 75% of these water borne diseases cases occur in tropical countries. Interventions in hygiene, sanitation and water supplies proved to control these diseases. Universal access to safe drinking water and sanitation has been promoted as an essential step in reducing these preventable diseases [6,7].

Shah *et al*, [8] assessed the drinking water quality of various railway stations on Ahmedabad to Khedbrahma train route in Gujarat (India) and recorded most of them unfit for drinking. Railway stations are the main source of drinking water for railway travelers and analysis of water is a very important in the evaluating of these supplies. A large number of railway passengers consume this drinking water on railway platform and this contaminated water may be the vehicle of transmission of water borne diseases.

Thus, risk assessment study was conducted to observe the effect of various factors, which affect the quality of drinking water on railway station in view of public health point. The sources of drinking water for railway passenger on the platform are taps, hand pumps, water coolers, canteens and restaurants, thus it is important to check the water quality available through these sources. In the present investigation, a pilot study on bacteriological quality of drinking water of various railway stations on Nagpur - Bhusawal Central railway route in Maharashtra state is performed.

Materials and Methods

A total of 160 water samples were collected from regular drinking water sources at 43 railway stations from Nagpur to Bhusawal Central Railway train route in Maharashtra during June to December 2006. These water samples were collected from water cooler (46), platform tap (69), canteen (16) and hand pump (29) in sterile sample bottles, date, time, source, collection station was noted and immediately transported to laboratory. The bacteriological examination was performed within the 24 h of collection using standard Multiple Tube Fermentation Technique (MTFT), nine multiple tube dilution technique using double and single strength Bromo-Cresol Purple MacConkey medium and Membrane filter techniques (MFT) by using M-EC test agar (Hi-media Lab. Mumbai). The MPN Index was calculated from MPN table and index of water more than 10 coliforms/dl is designated as contaminated or unhealthy for drinking purpose or non-potable [9].

Results

A total of 160 drinking water samples were analysed from 43 different railway station of Nagpur - Bhusawal train route in Maharashtra, during June to December 2006 for potability of drinking water by standard methods of water testing. Out of total 160 water samples, 38 (24%) water sample were safe whereas 122 (76%) drinking water

samples were polluted by MTFT and MFT test, mostly from tap water (83%) and railway canteen (75%) (Table 1).

Table 1: Station Grade wise and Source wise Potability of Drinking Water on Railway Stations

Water Quality	Station Grade	Total sample analysed	MPN Index	Source					Total	
				Water Cooler	Tap Water	Canteen	Hand Pump	Total		
Potable Water	A	34	0	9	8	1	0	18	26	
			<10	4	3	1	0	8		
	B	22	0	0	0	0	0	0	1	
			<10	0	0	1	0	1		
	C	41	0	0	0	1	0	1	2	
			<10	0	0	0	1	1		
	D	63	0	0	1	0	3	4	9	
			<10	0	0	0	5	5		
	Subtotal		160	<10	13	12	4	9	38	38
	Non-Potable Water	A	34	>10	4	4	0	0	8	8
B		22	>10	9	8	4	0	21	21	
C		41	>10	14	19	6	0	39	39	
D		63	>10	6	26	2	20	54	54	
Subtotal		160	>10	33	57	12	20	122	122	
Grant Total		160		46	69	16	29	160	160	

Out of 46 water samples collected from water coolers, 9 were free from coliform, 4 contain coliform <10/dl and 33 contaminated with coliform (>10 coliforms/dl). Out of 69 tap water samples, 8 showed no coliform, 4 had <10 coliform/dl, whereas 57 water samples polluted with >10 coliform/dl. Out of 16 canteen water samples, 2 each had zero to 10 coliform/dl whereas, 12 were contaminated with coliform >10/dl. Out of 29 hand pump water samples, 4 samples had zero and 5 had <10 coliform/dl, whereas 20 samples had >10 coliforms/dl (Table 1)

On the basis of number of passenger and number trains halts per station, the stations are categorized into 4 classes such as 'A', 'B', 'C' and 'D' grades. Out of 34 water samples collected from 'A' grade (main - Nagpur and Bhusaval) station, 18 showed zero, 8 had <10 coliform/dl whereas 8 samples were polluted with coliform density >10/dl. Out of 22 water samples collected from 'B' grade (moderate - Akola, Badnera, Wardha and Sevagram) station, 1 had <10 coliform/dl whereas 21 samples

were polluted with coliform density >10 /dl. Out of 41 water samples collected from 'C' grade (small) stations, 1 each had coliform density <10 /dl whereas 39 samples were non-potable with coliform density >10 /dl. Out of 63 water samples collected from 'D' grade (very small) stations, 4+5 samples had coliform density <10 /dl whereas 54 samples were contaminated and unfit for drinking purpose with coliform density >10 /dl (Table 1).

Discussion

The study showed that 160 water samples were analysed for potability of drinking water at railway station, out of them 46 water samples from water cooler (28% potable and 72% non-potable), 69 water samples from tap water (17% potable and 83% non-potable), 16 water samples from canteen (25% potable and 75% non-potable) and 29 water samples from hand pump (31% potable and 69% non-potable) (Fig. 1).

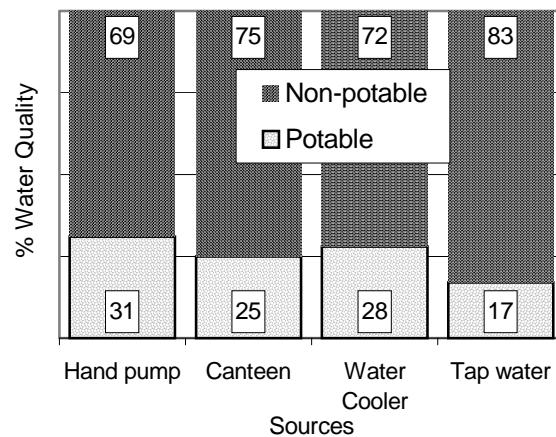


Figure 1: Quality of drinking water (Source wise)

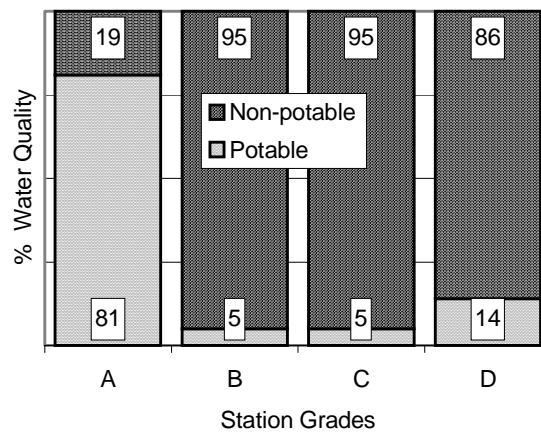


Figure 2: Quality of drinking water (Station wise)

The A grade stations provides 81%, B and C grade 5% and D grade stations provided 14% potable water to their passengers, indicating that moderate to very small stations provided 86% to 95% contaminated or polluted water to the passengers. The main or junction railway station (Grade A) authorities only provided good quality drinking water by maintaining proper water hygienic conditions and neglecting water hygiene at moderate to very small stations (Fig. 2).

Recommendations

The study recorded high bacterial contamination in tap water (83%) and canteen water (75%) as compared to water cooler (72%) and hand pump (69%) available at railway station's platforms. Good water hygienic conditions, such as frequent washing of storage tank, chlorination of water, washing of water cooler tanks, general water hygiene etc were maintain in main or junction railways stations, which leads to good hygienic conditions and the good or potable quality of drinking water at these stations. Moderate to very small stations provided larger quantity of contaminated water, it may be due to negligence of water hygiene, improper sanitary precautions to maintain the quality of drinking water. Hence it is recommended that proper water hygienic conditions should be maintained at all levels of collections, storage and distributions of water irrespective of turnover of passengers on stations.

References

- [1] WHO, 2006. Burden of Disease and Cost effectiveness estimates. World Health Organisation, Geneva.
- [2] Saha, S.K., Naznin, S., Ahmed, F., 2006. A Household Based Safe Water Intervention Programme for a Slum Area in Bangladesh, *Asian Journal of Water, Environment and Pollution*: 3(1): 21-25
- [3] Tambekar, D. H. and Banginwar, Y.S., 2005. Studies on potential intervention for control of water borne diseases: Promotion of storage, handling and serving practices of drinking water in hotels / restaurants. *Poll. Res*, 24(2): 371-378.
- [4] Tambekar, D.H. Gulhane, S.R. and Vaidya, P.B. (2005). Bacteriological quality index of drinking water in villages of Purna valley of Vidarbha by H₂S methods. *Nature Env. Poll. Technol*, 4(3): 333-337.
- [5] Tambekar, D.H., Hirulkar, N.B., Banginwar, Y.S., Rajankar, P.N. and Deshmukh, S.S. 2006. Water hygiene behaviors in hotels and restaurants and their effect on its bacteriological quality. *Biotechnology* 5(4): 475-477.
- [6] WHO, 1994. Guidelines for drinking water quality (Recommendation). World Health Organization. Geneva.
- [7] WHO, 2001. Guidelines standards and Health: Assessment of Risk and Risk Management for water-Related infectious disease. World Health Organisation, Geneva.

- [8] Shah, C., Mayur A., Shilpkar, P.G. and Shah, A.J., (2006). Assessment of drinking water quality of various railway stations on Ahmedabad to Khedbrahma train route in Gujarat, India. *Poll. Res*, 25(3): 549-552.
- [9] APHA, 1998. "Standard Methods for the Examination of Water and Wastewater" (20th ed.). Eds. Andrew D Eaton, Lenore S Classer and Arnold E Greenberg. American Public Health Association, Washington DC Part 9000: 9-140.