OPEN DEFCATION ALONG THE RAILWAY TRACT: A PROMINENT CAUSE OF WATER POLLUTION

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Abstract

Fecal pollution and open defecation leads to contaminating the drinking water and that causes water borne diseases. The aim of study was to study the effect of open defecation on household drinking water in the Amravati city. The study was conducted by collecting water samples (fresh and residual) from total 220 families which include 104 open defecation not free (ODNF) families along the railway line and 116 open defecation free (ODF) families. The study showed that 97% drinking water samples were potable before used and the quality of drinking water deteriorated to 56(55%) significantly after use in water sample collected from ODNF families. Total 22(23%) thermotolerant E coli were found in the drinking water samples of ODNF families. In the ODF families, 105(90%) samples were potable and 11(10%) samples were contaminated before used and 29(28%) sample were converted from potable to nonpotable after used. Thermotolerant E coli were found in 12 (11%) samples. Further, the study indicated that the total 85 (41%) drinking water samples was converted from potable to nonpotable and thermotolerant coliform was found in 34(17%) samples. The study conclude that the percentage of contamination was more in open defecation not free (ODNF) families as compare to the open defecation free families ODF, specially along the railway line contamination of drinking water was very high. Hence open defecation should be banned along the railway track and hygienic condition be maintained around the houses and surrounding and awareness on the open defecation should be increased in the society.

Key words- Railway line, open defecation, fecal contamination, drinking water, nonpotable

I. INTRODUCTION

It is now universally acknowledged by water and medical experts that the greatest risk associated with the drinking of water with the microbial risk due to water contaminated by human and/or animal faeces [1]. Open defecation plays a major role in contaminating drinking water and preference for open defecation may be due to traditional culture or lack of access to toilet, or both [2]. About 15% of the global population, practice open defecation and high levels of open defecation in India are usually correlated with high child mortality [3]. India has the highest number, 490 million of people practicing open defecation out of them, around 52% from rural area and (52%) and 7.5% in urban area [4]. Enteric pathogens associated with diarrhoeal disease are transmitted mainly through the faecal-oral route [5] which accounts for 1.8 million child deaths annually. Overall, 3.4 million people die annually as a result of water related diseases, making it a leading cause of disease and death around the world [6]. In India, 80% of the infection diseases such as typhoid, cholera, dysentery, and infectious hepatitis etc. are due to contaminated water [7,8]. Assurance of drinking-water safety is a foundation for the prevention and control of waterborne diseases [9].

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In the urban areas of India, open defecation mostly occurs along the railway line, cremation ground, burial place, urban parks, rivers, and open trenches, often surrounded by slum areas. In city, along the railway line people makes houses (zopadpatti) and these houses usually doesn’t have toilet and they defecate openly beside the railway line; since there is no wall compound or barricades to restrict these people. These people generally belongs to poor socio-economical group, low education and unaware of the hazards that unsafe drinking water may pose, having poor personal or domestic hygienic condition, do not knows about water sanitation and hygiene, contaminates the household drinking water more [10]. In railway, people uses the toilets during travelling hence this faecal matter fell down on the railway track, as very few trains in India having bio toilets or those having but not in all the coaches. This is also a type of open defecation. This faecal matter spread in the environment, may come in contact with the water and polluting it.

Eliminating open defecation is the main aim of improving access to sanitation worldwide and is proposed indicator for sustainable development goals. Therefore the need for behavioural change is critical in addition to the provision of toilets [11]. The main objective of the present study was to study effect of open defecation on household drinking water in open defecation free and open defecation not free families, especially along the railway line. This study is also carried out to find the association between waterborne diseases in the open defecated houses with respect to household drinking water.

II. MATERIALS AND METHODS

Sample Collection: The study was conducted in the Amravati city (Maharashtra, India) to examine the effect of open defecation on household drinking water. The study was based on the basis of selection, observation and collection of personal and family information. The drinking water sample (fresh and residual) were collected from 220 families that include 104 open defecation not free (ODNF) families (55 along the railway line and 49 from open ground) and 116 open defecation free (ODF) families. The collected samples were tested for its potability.

Potability Testing: The potability of collected drinking water samples (fresh and residual) were tested by rapid field Manja's H₂S test [12]. A 20 ml of drinking water was added directly in to the sterilized glass bottles which contain 01 mL H₂S medium and incubated these bottles at 37°C for 24h to 72h.

Detection of Thermotolerant Coliform: The nonpotable water samples further processed for the presence of thermotolerant E.coli by Eijkman’s test, sub-culturing in tryptone broth for indole formation and brilliant green lactose bile broth for production of acid and gas at 44.5°C. All bacteriological media were obtained from Hi-media pvt. Ltd, Mumbai, India [13].

III. RESULTS AND DISCUSSIONS

The most common and widespread health risk associated with drinking water is contamination, either directly or indirectly, by human or animal excreta and the microorganisms contained in faeces. A healthy living environment depends on toilets. Human waste enters water sources and land through open defecation, inadequate disposal into water sources and onto unused land, and leakage from pit latrines.

### Table 1: Quality of D.W. obtains from the source and from the container after used (remnants).

| Total sample | Quality of drinking water before used | Quality of drinking water After used | Nonpotable after used |
|--------------|-------------------------------------|-------------------------------------|-----------------------|
| H₂S Test     | TTC Positive | Non Potable | H₂S Test     | TTC Positive | Non Potable |
| 24h          | 48h         | 72h       | 24h          | 48h         | 72h       |
| ODNF Along the railway Track | 104 | 00 (0%) 1 (1%) 03 (3%) | 03 (3%) | 21 (22%) 49 (51%) 59 (61%) | 25 (26%) 59 (61%) | 56 (55%) |
The study was conducted by collecting water samples (fresh and residual) from total 220 families which include 104 open defecation not free (ODNF) families along the railway line and 116 open defecation free (ODF) families. The study showed that 97% drinking water samples were potable before used and the quality of drinking water deteriorated to 56(55%) significantly after use in water sample collected from ODNF families. Total 22 (23%) thermotolerant _E coli_ were found in the drinking water samples of ODNF families. In the ODF families, 105(90%) samples were potable and 11(10%) samples were contaminated before used, 29(28%) sample were converted from potable to nonpotable after used. Thermotolerant _E coli_ were found in 12 (11%) samples. Further, the study indicated that the total 85 (41%) drinking water samples was converted from potable to nonpotable and thermotolerant coliform was found in 34 (17%) samples (Table. 1).

Thus, the analytical data suggests that the drinking water from the ODNF families contaminated more as compare to the ODF families and the contamination occurred most in the drinking water of the families living along the railway line, this is because the people uses railway track and open space along the railway line for open defecation. The fecal matter dropped from the railway toilets on the track worsens the condition. This fecal matter mixes with the soil and ultimately goes in the air when the train passes and creates the air disturbances. This air with the fecal coliform contaminates the ground water as well as household drinking water along the railway line. Similarly, Tambekar and Rajgire [14], reported that drinking water in open defecation free villages was 17% fecal contamination whereas open defecation not free villages 48%. In both ODF and ODNF villages’ fecal contaminated drinking water samples was also showed poor water quality index (WQI) and detect antibiotic resistance _E. coli_. Thus, it clearly indicated that open defecation leads to contamination of ground water sources like open well, hand pump and tube well in villages.

In case of ODF families 28% drinking water converted to nonpotable, this may be due to microbial contamination of collected and stored household water caused not only by the collection and use but unsanitary and inadequately protected (open, uncovered or poorly covered) water collection and storage containers. Unsanitary methods of water serving from household storage vessels, including contaminated hands and dippers, and inadequate cleaning of vessels, which lead to accumulation of sediments and pathogens [10,15,16].

|        | Open defecation free | Total |
|--------|-----------------------|-------|
|        | 116                   | 220   |
| 2      | 10 (9%)               | 02 (1%) |
| 10     | 11 (10%)              | 11 (5%) |
| 11     | 7 (6%)                | 14 (6%) |
| 15     | 11 (10%)              | 14 (6%) |
| 34     | 15 (13%)              | 36 (16%) |
| 40     | 34 (34%)              | 83 (38%) |
| 19     | 16 (16%)              | 99 (45%) |
| 40     | 16 (16%)              | 99 (45%) |
| 29     | 10 (10%)              | 85 (41%) |

**Fig.1: Percent Nonpotablity and TTC positive of D.W. sample after used**
IV. CONCLUSION AND RECOMMENDATIONS

The study concluded that the percentage of contamination was more in open defecation not free (ODNF) families as compare to the open defecation free families ODF; especially along the railway line contamination of drinking water was very high. Thus open defecation is one of the most responsible factors that lead to contamination of drinking water. For preventing the drinking water from contamination; unhygienic practices must be stopped and provision of toilets to every household to control water is a useful means of attaining total sanitation. To protect the open defecation along the railway line, the wire fencing or compound wall should be constructed to restrict the entrance of humans and animals along the railway line and the coaches with bio-toilets must introduce. Number of public toilets should be increased in the area where the people can not afford construction costs of toilets or the fund should be provided to each and every family under “Swachh Bharat Mission” initiated by Ministry of urban development, Government of India. Hygenic condition should be maintained around the house and surrounding. Awareness regarding the open defecation should be increased in the society.

REFERENCES

[1] WHO (2004), Guidelines for Drinking Water Quality. 3rd Edition. World Health Organisation, Geneva, Switzerland.
[2] Clasen T, Boisson S, Routray P, Torondel B, Bell M, Cumming O, Ensink J, Freeman M, Jenkins M, Odagiri M, Ray S, Sinha A, Suar M, Schmidt WP, (2014). Effectiveness of a rural sanitation programme on diarrhoea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: a cluster-randomised trial. The Lancet Global Health, 2 (11): e645–e653.
[3] WHO, (2014) Water fact sheet no 39.
[4] Swachhata status Report, (2016). Government of India, Ministry of statistics and programme Implementation.
[5] Byers KE, Guerrant RL and Farr BM, (2001). Chapter 11: Fecal-Oral Transmission. In: Epidemiologic Methods for the Study of Infectious Diseases (eds Thomas JC & Webber DJ) Oxford University Press, Oxford, 228–248.
[6] Watkins K, (2006). Human development report. Beyond scarcity: Power, poverty and global water crisis. Retrieved from http://hdr.undp.org/en/media/HDR06_complete.pdf.
[7] WHO, (2009). Global health Risks Mortality and Burden of Disease, Attributable to selected Major Risks. WHO, Geneva, Switzerland. http://www.who.int/healthinfo/global_health_risk/en/index.html
[8] Liu L, Johnson HL and Cousens S, (2012). Global regional and national causes of child mortality; an updated systematic analysis for 2010 with time trends since 2000. Lancet 379, 2151-2161.
[9] Tambekar DH, Hirulkar NB, Kalikar MV, Patil YS and Gulhane SR, (2010). Prevalence of Thermotolerant Escherichia coli in drinking water and its Multidrug Resistance”, Research Journal ofMicrobiology, 5(11); 1180-1184.
[10] Tambekar DH, Dhote SV and Shinde GM, (2016). Household drinking water: Assessment of microbiological contamination between source and point of use. Bioscience Discovery, 7(2): 152-157.
[11] Nirmal Gram Puraskar Guideline, (2010). Government of India, Ministry of Rural Development Department of Drinking water supply, 1-7.
[12] Manja KS, Sambasive R, Chandra SKV, Nath KJ, Datta S, Gopal S, Lyengar L, Dahindas SS and Parija SC, (2001). Report of study on H2S test for drinking water. UNICEF, New Delhi.
[13] APHA, (2012). Standard Methods for the Examination of Water and Wastewater. (22nd Edn.). Washington DC, 9: 48-51.
[14] Tambekar DH and Rajgire AV, (2012). Open defecation: A source of fecal pollution in drinking water. Int J Adv Pharma Biol Sci, 2(3): 214-223.
[15] Tambekar DH, Wankhade SJ, Yadav SD and Tambekar SD, (2008). Correlation of antibiotics resistance profiling of E. coli andsource of fecal pollution in water, Pollution Research, 27(3), 507-510.
[16] Gundry S, Wright J and Conroy R, (2004). A systematic review of the health outcomes related to household water quality in developing countries. J Water Health. 2: 1–13.