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Community Medicine

ASSESSMENT OF BACTERIOLOGICAL QUALITY OF HOUSEHOLD WATER, ITS HANDLING AND STORAGE PRACTICES AMONG THE RESIDENTS OF RURAL AREA OF A TERTIARY CARE HOSPITAL.

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ABSTRACT The world bank estimates 5% of all deaths are directly due to poor quality and 21% of communicable disease in India are linked to unsafe water and the lack of hygiene practices.Lack of safe drinking water, basic sanitation, and hygienic practices are associated with high morbidity and mortality. In the present study, after obtaining informed written consent from one of the family member of each household the information on socioeconomic status of the family, assessment of water hygiene and storage practices at household level was collected using a predesigned questionnaire. Then the drinking water sample was collected for the bacteriological examination. Out of all water samples only 15% were of excellent quality. Out of all households where there was bare (direct) hand contact at the time of fetching water, about 85% water sample was found to be suspicious or unsatisfactory and this association was found to be statistically highly significant (p-value < 0.001). Excellent or satisfactory sample were 96% where water was transferred from source to house in a covered container and 98% samples where drinking water was stored in a separate container covered with lid. 83% of all suspicious/unsatisfactory household water samples were not using filtration.

KEYWORDS : Household water, Bacteriological quality, Storage and handling practices.

INTRODUCTION:

Water is considered sacred and is of mythological importance. Water availability is one of the major concerns for the rural setup. People are forced to use unsafe sources of water even when there is piped water supply. The probability of contamination of water increases significantly when people use several sources.(1)(2)

Biological contamination of drinking water is a major concern for public health authorities in developing countries. The World Health Organization has currently estimated that 1.1 billion people worldwide lack access to improved water supplies.(3) Piped water, public taps, tubewells or boreholes, protected dug wells, protected springs, and rainwater are considered “improved”; unprotected dug wells, unprotected springs, and surface water are deemed “unimproved”.(4) The drinking water specification and test protocol suggest that faecal coliform shall not be detectable in any 100 ml sample.(5) Limited access to safe drinking water and poor sanitation can lead to under nutrition, water borne diseases, gastroenteropathy along with diarrhoea and dysentery.(6) Total coliform is a non-specific indicator of faecal contamination and can originate from a number of different plant and soil sources.—(7) The world bank estimates 5% of all deaths are directly due to poor quality and 21% of communicable disease in India are linked to unsafe water and the lack of hygiene practices.(8) Lack of safe drinking water, basic sanitation, and hygienic practices are associated with high morbidity and mortality from excreta related diseases.**–(9)**

Rationale:- Similar research studies on bacteriological quality of drinking water and its association with storage and handling practices was not done in this rural area.

This research study will determine the gap between standard practices and its implementation at rural household level in regards to water quality and handling, storage practices.

Hence, the study was planned to assess the water storage, its handling practices at household level and its association with bacteriological count among the residents of village.

MATERIALS AND METHODS:

This study was a community based cross-sectional study conducted in a randomly selected village in rural area of central India. The study participants were the family members of the selected houses and the study duration was from July to September 2016. The selected village had three wards having three hundred and ninety four households, by using simple random table one ward was selected which had one hundred and four households. We planned to interview all the household in the selected ward by complete enumeration method, ten families couldn't be contacted even after three visits. Therefore, final sample size was ninety four households. All the household of the selected ward were included in the study. Household found to be locked even after 3 consecutive visits were exclude. Predesigned questionnaires were used for the collection of data. The tool comprises of socio-demograghic profile and water storage and hygiene practices. After explaining the purpose of the study and obtaining informed written consent from one of the family member of each household the socioeconomic status of the family was estimated by the help of Modified B.G. Prasad classification. Assessment of water hygiene and storage practices at household level was done using a predesigned questionnaire. Then the drinking water sample was collected for the bacteriological examination.

Sample collection process:- The samples were collected aseptically in 300 ml sterilized containers and immediately placed in ice lined box and transported within six hours of collection to the laboratory. The total coliform count test was based on the multiple tube fermentation method to estimate the most probable number (MPN) of coliform organism in 100 ml of water for diagnosis of bacteriological contamination. The test was carried out by inoculation (for 48 hours at 35°C) of measured quantities of sample water (5,10,50 ml) into tubes of double- and single-strength McConkey broth purple, HI media-M796 as an indicator. The results of MPN was interpreted based on McCrady's probability tables from the number of tubes showing acid and gas (fermentation by coliform organisms) to define the sample as satisfactory or unsatisfactory (Mackie and McCortney medical microbiology 14th edition) Bacteriological test was done in the departmental public health laboratory for the identification of coliform

bacteria which is accredited by ISO and was conducted with the help of laboratory technician.

Water quality:- The water quality intended for drinking should not detect E. coli or thermo tolerant coliform bacteria in any 100 ml sample (10)

OBSERVATIONS AND RESULTS:

TABLE:-1 Distribution of household according to socioeconomic status

Socioeconomic status	Social Class	No of families (%)
Class 1 (>6346)	Upper High Class	9(10%)
Class 2 (3173-6345)	High Class	11(12%)
Class 3 (1904-3172)	Upper Middle	17(18%)
Class 4 (952-1903)	Lower Middle	32(33%)
Class 5 (<951)	Poor	25(27%)
	Total	94(100%)

Above table shows that according to modified BG Prasad Socio-economic Class majority families belonged to lower middle class (33%) followed by poor class (27%).Only 10% of the families were in the upper high class in which the AICPI for 2017 is 277

TABLE: 2 Distribution of household according source of drinking water

S. No.	SOURCE OF WATER	No. of families (%)
1	Piped water into dwelling	15 (16%)
2	Piped water to yard/plot	13(14%)
3	Public tap/standpipe	28(30%)
4	Tube well/borehole	21(21%)
5	Protected dug well	03(04%)
6	Unprotected dug well	14(15%)
	Total	94(100%)

Table No. 2 showed that about 30% households were having drinking water supply from public tap or standpipe and about 21% households were having drinking water supply from tube well or borehole. None of the households used drinking water from surface source like .river, dam, lake, pond, stream, canal, irrigation channel.

TABLE 3: Water handling and storage practices in no of houses and its association with coliform count result

Sl. No	Water handling practices		Coliform		p-value
			Excellent/ Satisfactory	Suspicious/ unsatisfactory	
1	Contact of hand at the time of water collection	Present	11(23.9%)	41(85.4%)	<0.001
		Absent	35(76.1%)	7(14.6%)	
		Total	46(100%)	48(100%)	
2	Transportation of water from source to house with covered container.	Covered	44(95.7%)	17(35.4%)	<0.001
		Uncovered	2(4.3%)	31(64.6%)	
		Total	46(100%)	48(100%)	
3	Water for drinking is stored in a separate container	Separate	45(97.8%)	23(47.9%)	<0.001
		Not separate	1(2.2%)	25(52.1%)	
		Total	46(100%)	48(100%)	
4	Drinking water stored in container has no contact of hand	No	33(71.7%)	8(16.7%)	<0.001
		Yes	13(28.3%)	40(83.3%)	
		Total	46(100%)	48(100%)	
5	Cleaning container before fetching water	Yes	38(82.6%)	8(16.7%)	<0.001
		No	8(17.4%)	40(83.3%)	
		Total	46(100%)	48(100%)	

Out of all Suspicious/ unsatisfactory water samples about 85% households were having direct /bare hand contact at the time of fetching water, Transportation of water from source to house with covered container was 96% with excellent/satisfactory coliform count, these association was found to be statistically highly significant (p value <0.001).About 83% household water sample were not storing water separate for drinking purpose (p value <0.001),72% of all excellent/ satisfactory household water sample were having separate utensil for water drinking and 83% of all Suspicious/ unsatisfactory household water sample were cleaning before fetching (p value <0.001).

DISCUSSION:

It has been estimated that lack of safe water, sanitation and proper hygiene measures has led to 40% of total deaths and 5.7% of total disease burden globally. Water quality is concern from the start point till the consumption of water.(11) Access to improved water source along with proper handling practices can prevent significant disease burden. WHO defines it as piped water, public taps, tubewell, borehole, protected springs and rain water collection and public water supplies. It should be tested regularly, must be free from any coliform.

The present study was done for the assessment of bacteriological quality of drinking water along with the handling practices. Out of 94 households maximum of 30% were using public tap/ standpipe which was followed by tubewell/borehole. On assessing the need of water and hygiene practices most of the participants clean container before fetching but more than half population don't cover the container while taking to home and majority of them had contact of hand while fetching water.

In the study of **Anjana Kurberan et al** major sources of water were public tap/stand pipe and tube well/borehole (6) which is similar to water supply of present study . while in the study of **Suruchi Bhagra** done in and around Shimla hills, in which maximum coilform count were excellent.(12) which was contrary to the results in my present study thus, this indicate that my study area require better water disinfection practices. Another study of **Milhiyas Tabor and team** shows that majority had contact of hand while fetching water and 40% doesn't keep water in separate container for other purposes which is similar to my study results this shows that health education about proper water handling practices & sanitation need to implemented in the present study area.–(9).

Much of the ill-health which affects humanity, especially in developing countries can be traced to lack of safe and wholesome water supply.(13)(14) since there are several other cause of occurrence of diarrhoea but there is a association between the diarrhoea and the quality of drinking-water. Most of the study showed that the water treatment/storage interventions, sanitation practices, and health education are effective, and yet high-indicator coliform bacteria are present.

RECOMMENDATIONS:

- Periodic assessment of drinking water quality through accredited public health laboratory is recommened
- Health education and behavioural change communication strategies to be implemented through health workers
- Focus group discussion's among resident of the village can be planned on practices of water storage, handling practices and sanitation.

REFERENCES:

1. Surveillance for Waterborne Disease and Outbreaks Associated with Recreational Water --- United States, 2003--2004 [Internet]. [cited 2016 Jul 13]. Available from: http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5512a1.htm
2. Baum R, Kayser G, Stauber C, Sobsey M. Assessing the Microbial Quality of Improved Drinking Water Sources: Results from the Dominican Republic. Am J Trop Med Hyg. 2014 Jan 8;90(1):121–3.
3. Sidhu S, Malhotra S, Devi P, Gupta A. Bacteriological analysis of the drinking water from different schools in Northern India: A concern in developing countries. Int J Med Res Rev [Internet]. 2016 Apr 30 [cited 2017 Jun 6];4(04). Available from: http://medresearch.in/index.php/IJMRR/article/view/557
4. Ray S, Zaman F, Laskar N. Hand washing practices in two communities of two states of Eastern India: An intervention study. Indian J Public Health. 2010;54(3):126.
5. Indian Standards for Safe Drinking Water [Internet]. VCAN. [cited 2017 Mar 16]. Available from: http://togethervcan.in/?article=indian-standards-for-safe-drinking-water
6. Kuberan A, Singh AK, Kasav JB, Prasad S, Surapaneni KM, Upadhyay V, et al. Water and sanitation hygiene knowledge, attitude, and practices among household members living in rural setting of India. J Nat Sci Biol Med. 2015 Aug;6(Suppl 1):S69–74.
7. Strauss B, King W, Ley A, Hoey JR. A prospective study of rural drinking water quality and acute gastrointestinal illness. BMC Public Health. 2001 Aug 29;1:8.
8. India Water Crisis - Clean Water In India | Water.org [Internet]. [cited 2017 Jul 11]. Available from: https://water.org/our-impact/india/
9. Tabor M, Kibret M, Abera B. Bacteriological and Physicochemical Quality of Drinking Water and Hygiene-Sanitation Practices of the Consumers in Bahir Dar City, Ethiopia. Ethiop J Health Sci. 2011 Mar;21(1):19–26.
10. IndianJPublicHealth55270-1147726_031117.pdf [Internet]. [cited 2016 Aug 12]. Available from: http://www.ijph.in/temp/IndianJPublicHealth55270-1147726_031117.pdf
11. Brown J, Cairncross S, Ensink JHJ. Water, sanitation, hygiene and enteric infections in

children. Arch Dis Child. 2013 Aug;98(8):629–34.
12. Bhagra S, Singh D, Sood A, Kanga A. Bacteriological profile of water samples in and around Shimla hills: a study from the sub Himalayan region. Int J Community Med Public Health. 2017 May 22;4(6):1966–71.
13. Goel S, Sood R, Mazta SR, Bansal P, Gupta A. Bacteriological Quality of Water Samples of a Tertiary Care Medical Center Campus in North Western Himalayan Region of India. Internet J Third World Med [Internet]. 2006 Dec 31 [cited 2017 Jun 22];5(1). Available from: http://ispub.com/IJTWM/5/1/7335
14. Association IW, Organization WH, others. A practical guide to auditing water safety plans. 2015 [cited 2016 Jul 28]; Available from: http://apps.who.int/iris/handle/10665/204280