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Original Article

A STUDY OF UTILIZATION OF COMMUNITY REVERSE OSMOSIS (RO) WATER AND AWARENESS ABOUT IT AMONG RURAL HOUSEHOLDS IN RURAL HEALTH AND TRAINING CENTRE (RHTC) BHALAIANA

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***ABSTRACT*:**
Background: Punjab is becoming cancer capital of India due to increasing cancer rates especially in Malwa belt. Keeping in view the alarming increase in cancer incidence in this region, 1881 Reverse Osmosis plants have been installed in 16 districts of Punjab by the Government since 2010, but People are not utilizing this community RO water fully. Although 180 crores of rupees have been spent on installation of these RO plants by the government, but little attempts have been made to ascertain the extent of utilization of this water by the people and the Knowledge, Attitude and practices of the people residing in rural areas regarding community RO water. Aim of the study to assess the utilization and awareness of community RO water by the households in the study area. **Results:** There is only 50% utilization of community RO water as per this study. Most common responses elicited for not using community RO water was the unavailability of any family member for fetching this water (32%). Some other reasons observed were affordability (18%), accessibility due to distance of RO plant (15%) and dislike for taste of water (17%) though most of the households were aware of the risks of using contaminated water. **Conclusions:** though utilization of community RO water has increased as compared to past records still it is not as much as expected, since it has been 5 years since the installation of RO plants. Government heads to intensify its efforts in making people aware and solving the problems encountered in using community RO water.

Key words: Utilization , Reverse Osmosis , Punjab , Water , cancer

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INTRODUCTION

Water is the most important substance for life, second to air. Water which is safe enough to be consumed by humans with low risk of immediate or long term harm is called drinking water or potable water.[1] Man's health may be affected by presence of biological impurities e.g. bacteria responsible for dysentery, diarrhea and other diseases, viruses, protozoa, helminthes and leptospira. Or Chemical pollutants eg detergent solvents, cyanides, Heavy metals, minerals, organic acids, nitrogenous substances, sulphides, ammonia, dyes and pigments [2] The World Bank estimates that 21% of communicable diseases in India are related to unsafe water. [3] Unsafe water consisting of heavy metals (uranium, arsenic, chromium, nickel) may also be a reason for increasing cancer incidence in India, which is 80 per 100,000 population [4] There is a widespread occurrence of Arsenic and Fluoride in the groundwater [5]. In 1991, 13 of India's states and territories were reported to have high concentration of fluoride in water which rose to 17 by 1999[6] Situation is worse in Malwa region of Punjab. Cancer incidence in Malwa region is 107 per 100,000 population against a national average of 80 per 100,000 population, maximum being in Sri Muktsar Sahib District, (136 per 1,00,000) . [4] In most of the southern areas of Punjab, underground water contains total dissolved solids (TDS) in the range of 15000-35000 mg per liter (Normal is 0-500 mg per liter)[7] and a high uranium content [8] Multiple factors have been sited as

the culprits for underground water contamination e.g. Mismanagement of fly ash[9], granite rock intrusions present in this area[8], rampant use of pesticides and the heavily polluted Sutlej waters coming loaded with industrial effluents of towns like Ludhiana, Jalandhar and Phagwara through the Rajasthan feeder canal, which passes through Ferozepur, Faridkot and Muktsar [10] which is used for drinking purposes in most of the villages of this area. Keeping in view the alarming increase in cancer incidence in this region, 1881 Reverse Osmosis plants have been installed in 16 districts of Punjab by the Government, [11] But People are not utilizing this community RO water fully. Data from the department of public health reveals that only 14% of the rural households in Bathinda and Mansa Districts use RO water. [12] Most people want water at their door-steps while some consider it too costly to afford[13] Although 180 crores of rupees[11] have been spent on installation of these RO plants by the government, but little attempts have been made to ascertain the extent of utilization of this water by the people and the awareness of the people residing in rural areas regarding community RO water. So, this study has been taken up with the aim to assess utilization of community Reverse Osmosis water in the rural population along with awareness regarding the community RO water in the field practice area of Bhallaiana. aims of the study To assess the utilization and awareness of community RO water by the households in the study area.

MATERIAL & METHODS

The present study was a community-based cross-sectional study. It was conducted in field practice area at Rural Health and Training centre (R.H.T.C.) Bhallaiana. This centre is an integral part of Department of Community Medicine, Adesh Medical College & Hospital, Bathinda The centre is situated about 30 km away from the main city of Bathinda. The field practice area is composed of 13 villages where home based comprehensive health care is provided. The villages are Bhallaiana, Butter Shrin, Dhool Kot, Lohara, Mallan, Chatiana, Rukhala, Kotli Ablu, Sahib Chand, Chotian ,Kot Bhai, Sukhna Ablu and Kothe Chet Singh Wala. These villages have total population of 47,506 with 9115 households. [Source: Annual Survey Report 2013]. It is predominantly an agriculture region with majority of landowners as Jat Sikhs. The study population included all residents of the villages in the service area of RHTC Bhallaiana. The study unit comprised of selected households in the area. For this study, sample population of 1000 households was taken from field practice area of R.H.C. Cluster sampling technique was used to identify the clusters from the villages included in the study population. Sampling technique: Cluster sampling technique was used to identify the clusters from the villages included in the study population. 20 clusters were chosen applying the technique from the study population, according to their cumulative population and further, 50 households were chosen from each cluster by sytematic random sampling. The clusters chosen were 3 from village Bhalaiana, 2 from Butter Shrin, 3 from Mallan, 2 from Chotiaan, 1 from Rukhala, 1 from KotliAblu, 1 from Sahib Chand, 1 from Chotiaan, 4 from KotBhai and 2 from SukhnaAblu. Study period: Study started after approval from the Institutional Ethics Committee, and continued till the required number of households was met. Inclusion criteria included the households chosen by systematic random sampling. The households found locked after two repeat visits and The households where no adult (>18 years of age) member was found at the time of visit were excluded from the study. Utilization and awareness regarding community RO water among households was assessed by administering a predesigned and pretested proforma evolved for this purpose. (ANNEXURE – I) Questionnaire was administered personally by the investigator. Informed verbal Consent was taken from every subject. Proforma consisted of four parts: Part-I consisted of demographic details e.g. Head of the family, caste and Socio- economic status. The social class was determined by Modified Udai-Pareek scale [14] (Annexure II). Part-II consisted of questions about knowledge of the informants Part-III consisted of questions about attitude of the informants. Part-IV consisted of questions about utilization of RO water or other water sources by the household and reasons for the same A pilot study was carried out to test validity of protocol. It was carried out in 10% of proposed sample. Statistical Analysis: The data so collected was tabulated and analyzed. Responses for various questions were measured in frequencies and later on percentages were computed. Total utilization of RO water was also computed in percentage. Pearson's Chi Square test was used to compare the responses with community RO water utilization and with Socio-economic status. All the analysis was performed with the help of Microsoft Excel Sheet

RESULTS

Figure 1: Reasons for using community RO water(percentages) n=507

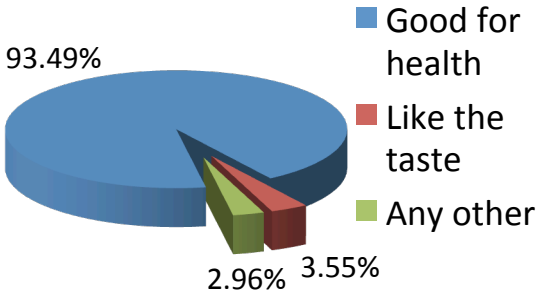

Table 1:Socio-demographic profile of study population

S. No.	Characteristics	Grouping	Number	percentage (N=1000)
1	Religion	Sikh	913	91.3
		Hindu	77	7.7
		Christian	0	0
		Muslims	5	0.5
		others	5	0.5
2	Number of family members	less than 5	565	56.5
		more than 5	435	43.5
3	socio-economic status	Grade I	2	0.2
		Grade II	71	7.1
		Grade III	285	28.5
		Grade IV	417	41.7
		Grade V	225	22.5

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Table 2. Awareness of the participants about drinking water

S. No.	Question (n=1000)	Aware (%age)	Not aware (%age)	Don't know
1	**Are diseases e.g. diarrhoea transmitted through water?**	**824 (82.40%)**	**176 (17.6%)**	
2	**Do you think that ground water in this area is not fit for drinking?**	**848 (84.80%)**	**152 (15.2%)**	
3	**Do you know there is a community RO plant in your village?**	**992 (99.20%)**	**08 (0.80%)**	
4	**Do you think that RO plant supplies safe water?**	**653 (65.30%) (yes)**	**250(25.00%) (no)**	**97 (9.70)**
5	**Do you think that cancer rates are high in this area?**	**841 (84.10%)**	**159 (15.90%)**	
6	**Do you think that cancer can be caused by contaminated water?**	**722 (72.20%)**	**278 (27.80%)**	

Table 3: Practice of the participants regarding drinking water

S. No.	Question	Grouping	Number	percentage
1	What is the source of your water? (n=1000)	Community RO water	507	50.70
		tap water	282	28.20
		any other	126	12.60
		hand pump	78	7.80
		tube-well	5	0.50
		home purified water	2	0.20
		pond water	0	00
		well	0	00
2	Reasons for not using Community RO water (n=549)*	Nobody ready to fetch it	176	32.06
		too costly to afford	101	18.40
		don't like the taste	93	16.94
		any other	89	16.21
		RO plant is far away	82	14.94
		never heard about it	8	1.45
3	What is the source of your water for domestic purposes? (n=1000)	well water	4	0.40
		hand pump	228	22.80
		tube-well	29	2.90
		municipal water	683	68.30
		any other	56	5.60

*56 household chose two options so the total number is 549 instead of 493(non-users of community RO water)

DISCUSSION

Utilization of community RO water: In present study, the utilization of community RO water comes out to be only 50.7%. Data from the department of public health (2012) reveals that only 14% of the rural households in Bathinda and Mansa Districts use RO water, Lack of awareness among villagers and distance from the water plant are cited as the main reasons for people not using RO water. [12] This may be due to better awareness due to government as well as RTHC Bhlaiana efforts that now people are aware of the harmful effects of contaminated ground water and so more people are using community RO water than previous records. In the present study, 50.70% households are using community RO water as their drinking water source. Among the non-community RO users (49.30%), major percentage is of tap water users (28.2%) which receive the municipal water supply through taps. Among the rest, majority is using other sources like canal water (12.6%). Very minor percentage is of tube-well users, hand pump users, and personal RO users. **Reasons for using community-RO water**: In present study, 92% of households were using RO water because they thought it was good for health only 8% preferred this water because they liked the taste of this water. While in a nationwide survey conducted in 2004 on 1754 bottled water users, 39% chose bottled water just because it tasted better while only 18% told it was because of health concerns[15] In a survey of consumers regarding home plumbing and drinking water (2005), 34% said that the aesthetic factors (taste, odor and color) were important while choosing the water for drinking[16] In another study, Maximum respondents (26%) mentioned that they had chosen this source because it was nearby; followed by 14% respondents who preferred tube well water because of its taste[17]

Reasons for not utilizing RO water: In the current study, most common reason for not using community RO water was the non-availability of any family member who was free for bringing this water (32%). Other reasons are cost factor (18%), distance of RO plant (15%) and disliking the taste of water (17%).

Cost factor has been highlighted in other studies too. A report by The Tribune (2015) states that the according to the residents, safe drinking water is their right and they refuse to pay the increased price of RO water which has been increased to Rs 90/ month by the government.[18] A study done in Gujarat (2007) describes various reasons Non-users in different villagers cite for non-adoption of community RO water. It concluded that, on an average, 55% cite high price of treated water as the main reason. The rest of non-users cite different reasons that range from disliking the taste, cultural reasons such as feeling that RO water would not stay safe in earthen pot, being content with current supply of drinking water.[19] An article at India Water Portal (21st june2015) describes that Though most residents can pay for the water, many don't either because they have access to a cheaper alternative or they consider community RO water to be of inferior quality.[20] The Tribune report (28th july 2014) of Bathinda, Punjab states that People believe canal water is better than the community RO water because this water plant uses ground water as inlet water

for purification so they prefer using canal water than paying for the purified ground water and moreover most of the villages have population that completely depend upon the old age pension of Rs 250 a month and cannot afford Rs 60 per month to pay the monthly bill or contribute money to transport water cans.[21] A report in the Indian express (2010) of Lehra, Sangrur, Punjab states that the local people thought that paying for water was not right as there are some very poor families in the village who cannot afford this[22] Distance from the source of water is also stated by other studies. A report by The Tribune of Bathinda district, Punjab (2014) states that distance from RO plant is one of the main hurdles in utilization of community RO water. People suggest it would have been better if water was supplied through pipes and only households located near the plant use RO water.[12] A Times of India report about Bathinda district, Punjab state (25th April 2013) concludes that most people want water at their door-steps while some consider it too costly to afford.[13] A survey conducted in Myanmar (2011) states that about 19.4% households reported difficulties in getting water from the water source [23] Gender issues are also behind lesser number of users in the rural areas because Fetching water from well or other sources has always been the duty of women. In current study, these reasons included in "Any other" category (16.2%) also includes other reasons like people not considering community RO water good for health and people having personal RO units at their homes

Awareness regarding water: In present study, Most of the people were aware of ground-water contamination and increasing cancer rates in the study area and they considered the ground water to be unfit for consumption. But as reported by other studies ,the respondents had very little knowledge about the presence and use of contaminated ground water.[24] This may be due to increasing cancers rates in this region of Punjab and also, people have been made aware by governmental efforts In current study, 82% believed that unsafe drinking water can cause diarrhea. But awareness about diarrhea and other diseases is very less in other studies. This may be due to major problem of water contamination in this area that people are aware of water borne diseases. A study by Bhattacharya et al (2011) states that 20% mothers were aware of the real cause of diarrhea. [25] Another study by Bharti et al (2013) states that only 33.5 % of informants had knowledge that unsafe water can cause diarrhea. [26] A KAP study on school children in Ethiopia states that about 65 % participants did not know about the route of transmission of waterborne diseases, while the others knew that waterborne diseases are mostly transmitted through drinking dirty water[27]. A study conducted in Myamar reports similar results as found in this study. It states that most households under study were aware of the potential negative impact of drinking unclean water on health. [23] In A study conducted in South Africa on school students (2013), 76.80 ± 1.75% of the respondents knew that there are waterborne diseases, even though they could not differentiate between cholera and diarrhea. However, about 65.0 ± 1.97% did not know about the route of transmission of waterborne diseases, while the others knew that waterborne diseases are mostly transmitted through drinking dirty water [28]

Usage of other purification methods

In the current study, out of the households not using community RO water for drinking, most of the participants were not using any purification method (67.14% or 33% of total) to purify the water they use for drinking. Out of the people not using any purification method, most of them assumed their water to be safe (39.4%) for drinking. Out of the rest, mostly people did not know (21%) about any purification method. Others told it was not beneficial (12.7%) or they could not afford the method (18.4%). Of the purification methods, Mostly, people had personal RO units at their homes (46%). Others were using boiling (20%), chlorine tablets (1.2%), alum (8%), and other methods like sedimentation and filtration through cloth. Results are similar to other studies.

Association of community RO water utilization with the awareness about water: after applying tests for qualitative data (test of significance of proportions and chi square test), there comes out a highly significant association of knowledge about water, water contamination, water purification methods, and contaminated water as cause of diseases with RO water usage signifying more is the knowledge about water, more is the community RO water usage. Similarly other studies have also reported that knowledge and practice are related significantly. Association of community RO water usage with socio-economic status also comes out to be highly significant (Chi-square= 25.1, p-value= <0.0000001) proving that users are more from the upper and middle class. Usage among the lower class people is less

CONCLUSION AND RECOMMENDATIONS

In light of the above findings of the study, it is recommended that government should intensify its efforts in making people aware about the community RO water. Another thing which was highlighted in the study was the problem faced by people in bringing the water, so the government should make efforts to make this water available at the homes of people so that everyone can use it. Efforts should be made to provide water free of cost/ subsidized rates to BPL families so that socio-economically weaker sections can also utilize this water because the effects of water contamination are always more prominent in that section of the society because of already compromised health status of these people. In this study also, lower class people are mostly non-users of community RO water. Water purification methods like chlorine tablets should be made available at every sub-Centre free of cost so that people who cannot afford costly water-treatment methods can use them and make their water free of disease causing organisms.

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