Assessment of knowledge, attitude and practices regarding utilization of safe water and effectiveness of community RO water among rural population of Punjab

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Abstract

Introduction: Contamination of ground water in Malwa region of Punjab has been in focus for at least last two decades. Higher than national incidence of cancer in Malwa region (107 against a national average of 80 per 100,000 population) is considered due to chemical contamination of ground water in this region . To ensure provision of potable water to rural Punjab, State government installed 1881 Reverse Osmosis (RO) plants in affected districts. Although 180 crores of rupees have been spent on installation of these RO plants, no study has been undertaken to evaluate the project. The present study attempts to fill this knowledge gap by quantifying the extent of utilization of Community RO plants, and assessing knowledge and attitude regarding this scheme of government.

Materials and Method: One thousand rural households in two districts of Malwa region were randomly selected to study the knowledge, attitude and practices of target population towards Community RO plants and their utilization through a cross-sectional study.

Results: The study revealed that 50.7% of households were consuming water from the Community RO plants, although the awareness regarding contaminated ground water in the region, and potential of contaminated water to cause diseases were much higher. The reasons for this knowledge-practice gap are highlighted. Most common of which are non- availability of any family member for fetching the water (32%), un-affordability (18%), distance of RO plant (15%) and disliking the taste of water (17%).

Conclusion: The study shows that any health program to fulfill felt-need of community should be piloted, and planned and implemented with community involvement, otherwise it is doomed to fail as the case of Community RO plants in Punjab where the utilization is mere 50% in spite of positive knowledge and attitude of the people.

Keywords: Water, Reverse osmosis, KAP, Cancer, Punjab.

Introduction

Water is the elixir of life. Life bloomed on our planet just because it had water. However, for health, humans need not only water, but water that is safe enough to be consumed with negligible risk of immediate or long-term harm.[1] World Health Organization estimates that 9% of the world's population does not have access to an improved drinking water source.[2] Contaminated water is a serious public health problem, and is linked to transmission of diseases like cholera, diarrhoea, dysentery, hepatitis, typhoid and polio. In addition, inadequate management of urban, industrial and agricultural waste water means that the drinking water of millions of people is chemically polluted.

Although India has made considerable progress in ensuring safe water to its populace, it has miles to go before the objectives are achieved. About 8% of India's population are yet to have access to improved water source. The World Bank estimates that 21% of communicable diseases in India are related to unsafe water.[3] Unplanned urbanization, rapid industrialization and un-regulated use of chemicals and fertilizers are contaminating the India's limited water resources.

Contamination of ground water in Malwa region of Punjab has been in focus for at least last two decades. Numerous studies have brought out elevated levels of total dissolved solids, total suspended solids and total solids in groundwater of this region, rendering the water non-potable. In addition, the water contains heavy metals e.g. arsenic, uranium, cadmium, chromium, nickel, lead and high fluorides.[4-7] Mismanagement of fly ash- a waste from thermal plants, presence of granite rock intrusions, rampant use of pesticides in agriculture, and discharge of untreated industrial effluents in the environment are considered reasons for the contamination.[8-10] Higher than national incidence of cancer in Malwa region (107 against a national average of 80 per 100,000 population) is considered due to chemical contamination of ground water in this region.[4] The major cancers are that of Breast, Cervix Uteri in females and of Lung, Prostate and Oesophagus in males.[11]

To ensure provision of potable water to rural Punjab, State government installed 1881 Reverse Osmosis (RO) plants in affected districts.[12] These plants were installed under public-private partnership (PPP) scheme, with private entrepreneurs permitted to collect a sum up to Rs 100/- pm from households utilizing the facility. Although 180 crores of rupees[12] have been spent on this scheme, but due to limited capacity of these plants, the water from the plants could not be connected to existing water distribution system, and it was expected that family members would collect treated water from the

plant that were located up to a maximum distance of 5 kms.[13,14]

The present study was undertaken to study the knowledge, attitude and practices (KAP) regarding potable water, by rural population in Malwa region of Punjab.

Materials and Method

The present study was a community-based cross-sectional study conducted in 13 villages of Bhatinda and Muktsar districts of Punjab from January to October 2015. These villages had a total population of 47,506 residing in 9,115 houses. The villages were selected based on convenience, being in the jurisdiction of Rural Field Practice Centre (RHTC) of a medical college. A minimum sample size of 960 households was calculated keeping the highest variance (50% prevalence of Community RO water users), relative precision 10%, level of significance 95%, design factor of 2 and unwilling to participate as 20%. Two stage cluster sampling technique was used to identify the sampling units (households)- in first stage 5 villages (clusters) were selected by proportion to population size technique, and the 2nd stage used random sampling to select 200 households in each selected village.

The data was collected from head of the family or 'lady of the house' on a pre-tested, validated, semi-structured questionnaire through interview technique. The questionnaire consisted of four parts: Part-I for demographic data, while part-II, III and IV captured data regarding knowledge, attitude and utilization, respectively. The social class was determined by modified Udai-Pareek scale [15]. Reasons for non-utilization of water from RO plants was identified through an open-ended question.

The data was analyzed using SPSS ver 20. Summary statistics has been calculated as proportions, and presented in tabular and diagrammatic forms. Approval of Institutional Ethics Committee, and village Panchayat was obtained. Informed consent from the informant was obtained. Confidentiality of the data was assured and has been ensured.

Results

Ours was a cross-sectional study that included 1,000 rural households in Malwa region of Punjab (India). The relevant socio-demographic variables are depicted in table 1.

Table 1: Socio-demographic profile of study population

Characteristics	Grouping	Number (n=1,000)	Percentage
^Age	20-35	93	9.3
	36-50	481	48.1
	51-65	298	29.8
	66 and above	128	12.8
^Sex	Males	900	90.0
	Females	100	10.0
Religion	Sikh	913	91.3
	Hindu	77	7.7
	#Others	10	1.0
Number of family members	Less than/ equal to 5	565	56.5
	More than 5	435	43.5
Socio-economic Class*	Upper	02	0.2
	Upper Middle	71	7.1
	Middle	285	28.5
	Lower-Middle	417	41.7
	Lower	225	22.5

^ relates to the person interviewed
#Category "Others" include Christians and Muslims
*Uday Pareek Socio-economic Scale (modified)

The knowledge and beliefs of 1,000 respondents regarding role of water in general, and specific to Malwa region are depicted in Table 2.

Table 2. Knowledge and beliefs of the Respondents about drinking water

S. No.	Question	Grouping	Number (n=1,000)	Percentage
1	Can consumption of polluted water transmit diseases?	Yes No	824 176	82.4 17.6
2	Are you aware that ground water in this area is not fit for drinking?	Yes No	848 152	84.8 15.2
3	Are you aware that there is a community RO plant in your village?	Yes No	992 08	99.2 0.80
4	Do you believe that RO plant supplies safe water?	Yes No Don't know	653 250 97	65.3 25.0 9.7
5	Are you aware that cancer rates are high in Malwa region?	Yes No	841 159	84.1 15.9
6	Do you think that high cancer rates in Malwa region are due to ground water?	Yes No	722 278	72.2 27.8

As seen above, 82.4% of study population were aware that polluted water can transmit diseases, and 65.3% were had knowledge that RO plant renders potable water. Also 84.1% respondents were aware of higher rates of cancer in the region, although 72.2% attributed this to contaminated ground water.

Fig. 1 highlights the perception of respondents regarding reasons for unsafe water in the region. The figure depicts 1049 responses from 848 'Yes' respondents to question 2 in Table 2.

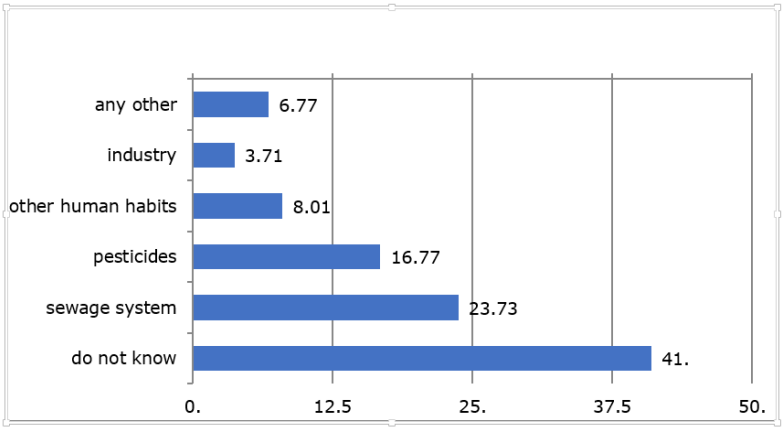

Fig. 1: Reasons for unsafe water in Malwa region (subjective)

Any other category includes reasons like excessive ground water usage, contamination due to underground rocks etc.

The attitude of the respondents is tabulated in Table 3. The table reveals that almost 31% of respondents were not keen to subject the water being received by them for further treatment. This finding is important as it shows the need for society (Govt/Panchayat) to ensure distribution of safe water to households in rural areas.

Table 3: Attitude of Respondents regarding Drinking Water

S. No.	Question	Grouping	Number (n=1,000)	Percentage
1	Would you like to purify water by any means before drinking?	Yes No	691 309	69.1 30.9
2	Which water source you prefer for drinking?	Community RO Tap water Hand pump Home purified	650 180 46 33	65.0 18.0 4.6 3.3

		Pond water Canal water	03 88	0.3 8.8
3	Is Punjab Govt scheme of installing RO plants in villages beneficial to people?	Yes No Can't comment	613 128 259	61.3 12.8 25.9

The practices of the households regarding consumption of water for potable purposes and reasons thereof are tabulated in Table 4.

Table 4: Practice of the Participants regarding Drinking water

S. No.	Question	Grouping	Number (n=1,000)	Percentage
1	What is the source of your water for potable purposes?	Community RO water Tap water Hand pump Tube-well Home treated water Canal water	507 282 78 5 2 126	50.7 28.2 7.8 0.5 0.2 12.6
2	Reasons for not using Community RO water (n=493) *	Nobody ready to fetch it Too costly to afford Don't like the taste RO plant is far away Never heard about it #Any other	176 101 93 82 8 89	32.1 18.4 16.9 14.9 1.5 16.2
3	What is the source of your water for domestic (other than drinking/cooking) purposes?	Municipal water Tube well Well water Hand pump Canal water	683 228 29 04 56	68.3 22.8 2.9 0.4 5.6

*Total responses exceed 493 because of multiple responses by 56

#Any other category consists of reasons like gender issues (men considering it women's job to bring water but women couldn't not bring a can of 20 litres on their own), people not considering RO water good for health, people complaining knee pains after drinking RO water or people having personal RO units at their homes.

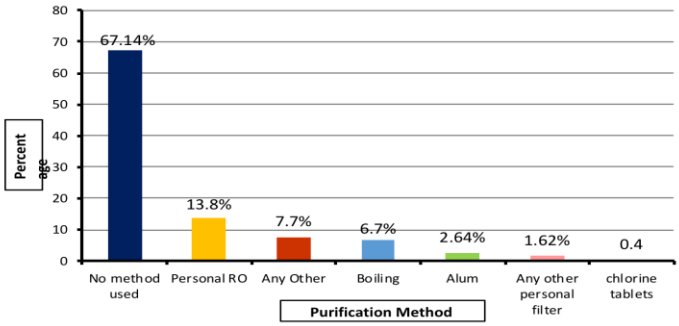

Fig. 2: Alternative method of water purification used by people not using community- RO water

"Any other" includes sedimentation and filtration through cloth

Discussion

The present study conducted among 1,000 rural households in Malwa region of Punjab state to identify the KAP of the community regarding utilization of safe water and effectiveness of community RO water in ensuring supply of potable water to rural populace.

Knowledge regarding Water: In present study, 85% of the respondents were aware of ground-water contamination in the region, and almost 3/4th considered the ground water contamination to be a reason for high cancer rate. This finding showed a northward trend in awareness from an earlier study.[16] This may be due to increasing awareness of the populace on the subject through mass media. 82% of respondents knew that unsafe drinking water can cause diseases. This was in contrast to studies by Bhattacharya et al[17] and Bharti et al[18] reporting that only 20% and 33.5% of respondents,

respectively were aware of potential of water to cause infections.

Attitude regarding water: In the present study, Most of the participants wanted to have community RO water as their drinking water source and they had positive attitude regarding recommending RO water to others, still only half were using it. This may be due to reasons like cost factor, distance of the RO plant and wastage of time bringing the water.

In the present study, not much number of participants (56.4%) were having positive attitude about the prevention of cancer in long term through the government's scheme of installing RO plants. Other studies also revealed that regular users of government sources expressed dissatisfaction related to water quality[19] similar to the current study, where almost half of the participants thought the government's scheme would not be of much use in preventing cancers in long term.

Practices regarding water: The study revealed that 50.7% of households were utilizing the facility. Analysis shows that 92% of households using RO water were doing so because the water from the RO plants was 'good for health', while the rest 8% preferred the source because of its palatability (taste). In a survey conducted in 2004 on 1,754 bottled water users, 39% chose bottled water just because it tasted better, while 18% selecting it for safety considerations. [20] In a survey of consumers regarding drinking water (2005), 34% said that the aesthetic factors i.e. taste, odor and color were important factors for choosing the water for drinking. [21] In another study, 26% of respondents mentioned that they had chosen the water source because it of its proximity, while 14% respondents had selected the water-source because of taste.[19]

In the present study, most common reason (32%) for not using community RO water was the non- availability of any family member for fetching the water. Other reasons were un-affordability (18%), distance of RO plant (15%) and disliking the taste of water (17%). These findings of the study were in consonance with other studies that mentioned economic factors,[22-24] non-palatability,[21] and distance from the RO plant[13,14,25] as reasons for non-utilization of water.

In the current study, 493 households were not using community RO water for drinking. Most of these households (67.1%) were not using any purification method. The reasons for the same were assumption that their water source was safe (39.4%), unaware of any purification method (21%), inability to afford (18.4%), and 'felt no need to purify' (12.7%). Out of households using a purification method (other than community RO plants as water source) 46% had household RO units, 20% were boiling, 1.2% ware using chlorine tablets, and rest were using other methods like sedimentation by adding alum, sieving through cloth or both.

Association of community RO water utilization with the awareness about water and other variables: 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

A cross sectional study on 1,000 households reveals that only half the households were using the community RO plants as a source of their potable water requirements; in spite of positive knowledge and attitude of the people in a region where chemical contamination of ground water is well established and recognized. And among the non users of Community RO water, majority of households were devoid of safe and potable water as they did not use any purification method for their drinking water, which remains a big health related concern. So a welfare activity (for e.g. supply of safe water to rural community through establishment of RO plants in PPP mode) done without community involvement would have limited success, as observed in this study, where half the population still lacks safe, clean and potable water for drinking.

Recommendations

The study findings bring out the need to intensify efforts in making community aware about the availability of community RO water plant in their neighborhood, and their effectiveness in supplying safe water. As safe water is the single most important determinant of health of populations, the government should supply community RO water, free of cost, and at household levels preferably through water distribution system, or at least through delivery at the doorsteps.

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