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Research Article

Drinking water and sanitation: household survey for knowledge and practice in rural area, Magudanchavadi, Salem district, India

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ABSTRACT

Background: Water is basic human right, most precious resource for economy and health. Sanitation is determinants of quality of life and individual's hygiene can affect the whole community. Drinking water and sanitation is a fundamental health service.
Methods: It is a community based cross sectional study conducted in Rural Health Training centre, Magudanchavadi, the field practice area of Annapoorana Medical College and hospital, Salem, Tamilnadu. Sample size was calculated through the universal formula n = z2pq/d2 and sample size was finalized to 300 houses. Data was compiled in MS Excel and analyzed in institutional SPSS version 16.
Results: Out of 300 households adult females were 154 (51.3%), literacy level was till matriculation 160 (53.3%) and families belonged to middle class 154 (51.3%). Households had knowledge of covered drinking water 289 (96.3%), clean drinking water 255 (85%), covered garbage dustbin 185 (61.7%), sanitary toilet 249 (83%) and hand wash after toilet 282 (94%). Households were practiced covered drinking water 284 (94.7%), collected water for drinking purpose from pipeline 256 (85.3%), boiling method used for purification of drinking water 136 (45.3%), uncovered garbage dustbin 162 (54%), garbage found openly in premises 173 (57.3%), toilet facility 188 (62.7%), open air defecation 97 (32.3%) and hand wash after toilet with soap 198 (66%). Their knowledge was significantly associated with practice of it.
Conclusions: Knowledge was good enough but unhealthy practices make health education very important for better use of existing facilities and also to prevent the incidences of water and sanitation related diseases.

Key words: Knowledge, Practice, Drinking water, Sanitation

INTRODUCTION

Water is the essence of life and basic human right essential to all and for sustainable development. It is known that drinking water is our most precious resource for our economy, our daily lives and to the health of our environment.[1] Sanitation is one of the determinants of quality of life and human development index. It has been both public and private elements, and the individual's hygiene can affect the whole community. Drinking water and sanitation is a fundamental health service without which there cannot be any improvement. Drinking water and sanitation inadequacies hinder economic and social development, constitute a major hurdle to poverty alleviation and inevitably lead to environmental degradation.[2]

The year 2005 marked the beginning of the "International Decade for Action: Water for Life" and renewed effort to achieve the Millennium Development Goal (MDG) 7, target 10 aims to reduce by half the proportion of the world's population without sustainable access to drinking

water and sanitation by 2015.[3] Globally, almost three quarters of them live in rural areas and only half of the rural population uses an improved sanitation facility. Assessing progress towards the MDG target alone creates an incomplete picture and countries that started out with low baseline coverage have had to work much harder to halve the proportion of the population without water and sanitation. This is the added challenge of rapid population growth and moreover it is the poorest countries that are often characterized by a combination of low baseline coverage and high population growth. The world is unlikely to meet the MDG sanitation target by 2015.[4]

Drinking water and sanitation is the door way to health which is the pre-requisite for progress, social equity and human dignity to improve the quality of life of people. It is one of the most important felt needs in public health in developing countries in this 21st century.[5] However, it is still an ignored issue in India and lack of drinking water and adequate sanitation is a key contributing factor to the ongoing high rates of health related disease noted in developing countries.[6] India is still lagging far behind many countries in the field of drinking water and sanitation in which most of the problems in the country are due to defective environment, which in turn rob people of their health, destroy their livelihoods and undermine their overall development potential and improvement in drinking water and sanitation has been consistently identified as being an important intervention to improve health.[7]

Objective of the study was to assess the sociodemographic profile, **t**o assess the knowledge on drinking water and sanitation among people residing in the field practice area of Annapoorna Medical College, Salem and **t**o assess the practice on drinking water ,sanitation and hygiene among people residing in the field practice area of Annapoorna Medical College, Salem and to find the association between knowledge and practice related to drinking water and sanitation

METHODS

It is a community based cross sectional study conducted during March 2014 in Rural Health Training centre, Magudanchavadi, the field practice area of Annapoorana Medical College & hospital, Salem, Tamilnadu. Field practice area covers 8,871 population (2011 census) and most of them were involved in small scale industries mainly cotton mills and home based or network based weaving. The sampling units were the households and sample size was calculated based on the universal formula n = z2pq/d2 where in, z = 1.96, (at 95% confidence levels), p = 78.5 (access to drinking water nearby premises in rural Salem, Tamilnadu), q (1-p) = 21.5, Absolute precision 'd' taken at 5% = 0.05.[8] Using the above formula, the sample size calculated was 270, and accounting for 10% nonresponsive, the sample size calculated was 297. Therefore sample size of the study was finalized to 300 houses.

Structured questionnaires were prepared, which include the basic sociodemographic profile, knowledge and practice questions regarding drinking water and sanitation of households in the rural communities of the study area. The questionnaire was pre-tested in few selected household. The pre-test was conducted near the study area which had similar characteristics to the areas where the actual study was carried out. Vague terms, phrases and questions identified during the pre-test were modified and changed and missing responses like 'no response' and 'others' were added, and skipping patterns were also corrected. The questionnaires were then administered to the selected study households at their respective residential places.

A pre-tested restructured questionnaire was used as a tool for the study and study was carried out by house to house visit. Convenient purposive sampling technique was applied because the sampling frame of the population of that area was not available. Interview was conducted face to face and study subjects were enrolled till the required sample size was met. Information was collected by interviewing the available adult family member at the time of visit, and also, by physical examination of facilities. Consent was taken from the household member and those families which were not available at their houses and who didn't give consent were excluded.

Data collected were compiled in MS Excel software and analyzed in institutional SPSS version 16. Variables of knowledge and practice of drinking water and sanitation were analyzed either by chi square or Fischer exact test, data was presented in percentages (%) and proportions form and statistical significance was considered at 0.05 level.

RESULTS

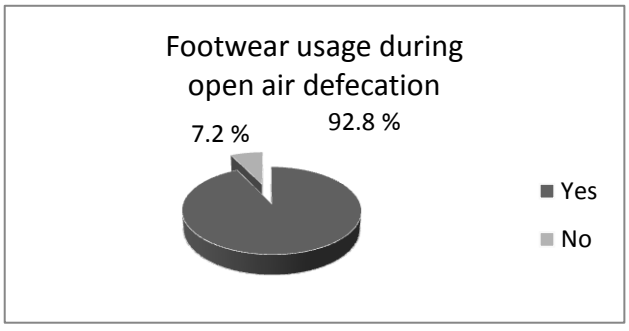

Figure 1: Pie chart showing percentage of people using footwear during open air defecation.

81 (27%) of them were illiterate, out of whom 154 (51.3%) of families belonged to middle class and 90 (30%) of families belonged to the upper socioeconomic class according to Convenient form of modified B.G. Prasad revised income categories for all India (IW) 2014 as shown in Table (1).

Most of households had knowledge about the importance of covered drinking water 289 (96.3%) followed by clean drinking water 255 (85%), cleaning of river/pond water 219 (73%), covered garbage dustbin 185 (61.7%), sanitary toilet 249 (83%) and hand wash after toilet 282 (94%) as shown in table (2).

Table 1: Distribution of study subjects by sociodemograhic characteristic (n=300).

Sociodemograhic characteristics		Frequency (n)	Percent (%)
Age	20-40	159	53.0
	41-60	110	36.7
	>60	31	10.3
Sex	Male	146	48.7
	Female	154	51.3
Education	illiterate	81	27.0
	High school	160	53.3
	> High school	59	19.7
Occupation	unemployed	56	18.7
	skilled	145	48.3
	unskilled	99	33.0
Convenient form of modified B.G. Prasad revised income categories for all India (IW) 2014	Lower class	56	18.7
	Middle class	154	51.3
	Upper class	90	30.0
Total		300	100.0

Table 2: Distribution of study subjects by Knowledge on drinking water and sanitation.

Knowledge	N=300	No. of houses (n)	Percentage (%)
Drinking water should be covered	Yes	289	96.3
	No	11	3.7
Clean drinking water should be used	Yes	255	85.0
	No	45	15.0
Rivers/Ponds water should be clean	Yes	219	73
	No	81	27
Garbage dustbin should be covered	Yes	185	61.7
	No	115	38.3
Sanitary Toilet should be used	Yes	249	83.0
	No	51	17.0
Hand wash after toilet	Yes	282	94.0
	No	18	6.0
Total		300	100

A total of 300 households were visited for the study purpose. Most of the respondents were adult females 154 (51.3%) and belonged to 20-40 years age group 159 (53%). The most common occupation of head of household was skilled 145 (48.3%) followed by unskilled 99 (33%). The literacy level of head of majority of households was till matriculation 160 (53.3%) and around

Table 3: Distribution of study subjects by Hygienic practice on drinking water and sanitation.

Hygienic practice	N=300	No. of houses (n)	Percentage (%)
Drinking water was found cover	Yes	284	94.7
	No	16	5.3
Source of drinking water	Pipe line water	256	85.3
	Others*	44	14.7
Pipe line water = tube well, tape water, hand pump, Others* = River/pond/lake			
Distance of source of drinking water	Within premises	135	45.0
	Outside of premises	165	55.0
Water purification method	Boiling	136	45.3
	Others**	118	39.3
	None	46	15.3
Others** = Chlorine tab., Cloth filtration, RO System			
Garbage dustbin was covered in premises	Yes	138	46.0
	No	162	54.0
Garbage was found openly in premises	Yes	173	57.7
	No	127	42.3
Toilet facility was available	Toilet within premises	188	62.7
	Open air defecation	97	32.3
	Community toilet	15	5.0
Foot wear used for toilet	Yes	233	77.7
	No	67	22.3
Hand washing after toilet	Soap water	198	66.0
	Others***	102	34.0
Others*** = Ash, Mud, Plain Water			
Total		300	100

We found that the access to water facility was 100% as all the houses derived water from sources. Table (3) was shown covered drinking water was found 284 (94.7%) and majority households 256 (85.3%) collected water for drinking purpose from pipeline followed by remaining others 44 (14.7%). They were travelling for fetching drinking water 165 (55%) outside of premises followed by 135 (45%) within premises. It was seen that majority

136 (45.3%) households used boiling method for purification of drinking water followed by 118 (39.3%) of them treat drinking water by other methods and 46 (15.3%) households did not use any treatment for purification of water. Average 162 (54%) households had uncovered garbage dustbin, garbage found openly in premises 173 (57.3%) and households were had a toilet facility within premises 188 (62.7%) of which toilets were sanitary 161 (53.7%), households without toilet facility who used open air defecation 97 (32.3%), households did not use footwear for toilet 67 (22.3%), households washed their hands after toilet with soap 198 (66%) and remaining by others like as Ash, Mud, Plain Water 102 (34%).

Table 4: Association of knowledge and practice of respondents on drinking water and sanitation.

Practice		Knowledge			CI = 95%	
		Yes (%)	No (%)	Total (%)	$\chi 2$	P value
		Clean drinking water should be used				
Drinking water was found cover	Yes	249 (83.0)	35 (11.7)	284 (94.7)	29.909	0.00
	No	6 (2.0)	10 (3.3)	16 (5.3)		
Distance of source of water	within premises	123 (41.0)	12 (4.0)	135 (45.0)	7.190	0.007
	Outside of premises	132 (44.0)	33 (11.0)	165 (55.0)		
Water purification method	Boiling	130 (43.3)	6 (2.0)	136 (45.3)	1.479	0.00
	Others	113 (37.7)	5 (1.7)	118 (39.3)		
	None	12 (4.0)	34 (11.3)	46 (15.3)		
Others** = Chlorine tab., Cloth filtration, RO System						
		Drinking water should be covered				
Drinking water was found cover	Yes	279 (93.0)	5 (1.7)	284 (94.7)	54.773	0.00
	No	10 (3.3)	6 (2.0)	16 (5.3)		
		Rivers/Ponds water should be clean				
Water purification method	Boiling	115 (38.3)	21 (7.0)	136 (45.3)	67.477	0.00
	Others	93 (31.0)	25 (8.3)	118 (39.3)		
	None	11 (3.7)	35 (11.7)	46 (15.3)		
		Garbage dustbin should be covered				
Garbage dustbin was covered in premises	Yes	123 (41.0)	15 (5.0)	138 (46.0)	81.541	0.00
	No	62 (20.7)	100 (33.3)	162 (54.0)		
Garbage was found openly in premises	Yes	94 (31.3)	79 (26.3)	173 (57.7)	9.292	0.002
	No	91 (30.3)	36 (12.0)	127 (42.3)		
		Sanitary Toilet should be used				
Toilet within premises	Yes	183 (61.0)	5 (1.7)	188 (62.7)	73.394	0.00
	No	66 (22.0)	46 (15.3)	112 (37.3)		
Hand wash after defecation	Soap	174 (58.0)	24 (8.0)	198 (66.0)	9.824	0.002
	Others	75 (25.0)	27 (9.0)	102 (34.0)		
Others*** = Ash, Mud, Plain Water						

Table (4) showed significant association between different variable of knowledge and practice related to drinking water and sanitation. Knowledge of clean drinking water was significantly related with practice of covered water 249 (83%), distance of source 123 (41%), cleaning and disinfectant for water 243 (96%). Similarly, knowledge regarding covered drinking water 279 (93%) and Rivers/Ponds water 208 (96.3) was significantly associated with practice of cleaning and disinfectant for drinking water. Knowledge of covered garbage dustbin was significantly associated with practice of covered garbage dustbin 123 (41%) and garbage found openly in premises 94 (31.3%). Likewise knowledge of sanitary toilet was significantly associated with practice of toilet within premises 183 (61%) and hand wash after defecation 174 (58%). Table (5) was showing hygiene practice significantly related to toilet facility. Toilet within premises 134 (44.7%) and sanitary toilet within premises 124 (66%) had shown significant association with soap hand washing practice. Figure (1) was shown nearly 90 (92.8%) used footwear during open air defecation.

Table 5: Association of respondents on hygienic practice.

		Hand wash after defecation			CI = 95%	
		Soap (%)	Others (%)	Total (%)	$\chi 2$	P value
Toilet within Premises	Yes	134 (44.7)	54 (18.0)	188 (62.7)		
	No	64 (21.3)	48 (16.0)	112 (37.3)	6.248	0.012
Sanitary toilet within premises	Yes	124 (66.0)	37 (19.7)	161 (85.6)		
	No	10 (5.3)	17 (9.0)	27 (14.4)	18.054	0.00
Others*** = Ash, Mud, Plain Water						

DISCUSSION

Provision of drinking water has been of primary concern in rural India.[9,10] In Tamil Nadu, there are guidelines for provision of potable drinking water in villages and to ensure segregation of sewage and drinking water. This includes setting up village level water and sanitation committee to formulate a master plan for sewage and drainage.[11] These guidelines state that water pipes should not go through sewage or should not be submerged in sewage at any point. However, sewage channels were found to run parallel to water pipes and cross them at various junctions. Since these are open sewage channels, there is the possibility of sewage mixing with the piped water, especially as the water supply is intermittent, causing negative pressure in pipes and after rain, entry of sewage through these taps was a distinct possibility. In order to ensure proper segregation of sewage and faeces from drinking water, alternate designs are needed. Elevating the water pipe at places where water lines cross sewage and covering the sewage channels at junctions are possible methods to minimize contact of sewage with drinking water. [12]

In our study, most of females were homemakers mostly engaged in household activity whereas head of the family was busy in their job. More than half of respondents studied up to matriculation and reported sufficient knowledge about drinking water and sanitation but did not practice it and their economic status was poor as compared to Swaroop N et al.[13] Study reported that most of respondents had knowledge about importance of covered drinking water in prevention of diseases that was nearly similar to 96.8% in study by Bharti et al.[14] Households had higher knowledge about importance of clean drinking water and hand wash after toilet as compared to (76.92%) in study of Sah et al.[15] They had higher knowledge on clean drinking water were significantly associated with implement of covered drinking water practice for better health and protect from water born disease.

The last two decades have seen major shifts in the proportion of the global population using various types of drinking water sources. The biggest change has been the increase in piped water supplies on premises, the use of piped water on premises grew even faster from previous and over the same period, reliance on surface water was halved, in rural areas.[4] Majority of household significantly practiced covered drinking water in premises as they had knowledge about covered drinking water and 58 (58%) households collected water for drinking purpose from a pipeline which was lower in Swaroop N et al study.[13] Households who collected water within premises was found similar to 43 (43%) pipe water in premises and more outside water source respectively comparatively as Swaroop N et al study and opposite seen in other rural area of Salem district where water source within premises 9% and outside from premises 91% respectively.[8] knowledge on clean drinking water significantly associated to fetching water from outside water source due to there was more chance of water contamination and need to be treated.

It was seen in our study that boiling method more commonly used than straining through cloth for purification of drinking water but Swaroop N et al showed opposite of it.[13] The commonest form of disinfection in rural India is single-point chlorination using bleaching powder whereas this may not be effective because of the possibility of multiple sites of contamination and the amount of chlorine added was inadequate by the WHO standards.[12,16,17] Water is pumped every day but the current TWAD Board guidelines specify that chlorination should be done once a month, thus requiring modification.[11] Alternative point-of-use disinfection methods such as solar water treatment, point-of-use chlorination and storage of water in narrow-mouthed vessels need to be explored. [18,19,20,21]

Considering the contamination of all water samples at the household level, end-user disinfection is likely to be more effective in such settings.[22] However, such methods may not be sustainable over longer periods or may not be cost-effective in rural India.[23] The practice of tethering animals close to human dwellings and the consequent proximity to animal faecal matter further enhances the risk of contamination of drinking water.[24,25] The key to providing microbiologically clean drinking water lies in understanding the various mechanisms by which water gets contaminated, and formulating interventions at critical points to decrease and prevent contamination of drinking water.[26] Approximately 45 (15.3%) households did not use any treatment for purification of water due to knowledge about clean drinking water and water source

like river, pond significantly impact on water treatment practice whereas in India average 72.7 per cent of the rural population does not use any method of water disinfection.[27] Bhattacharya et al. also found 72% of household don't follow any treatment and drink it as it.[28] Study reported treating water at home at any point during the year, for the most part seasonally or occasionally rather than year-round. Common triggers for treating water are a change in its appearance or illness in the family mainly increased turbidity during the rainy season may prompt households to treat water, and women often boil water for a sick child or elderly family member and water treatment as a curative, rather than preventive, health measure, to be used in case of sickness.[29]

More than half of households ware significantly had uncovered garbage dustbin and garbage was openly in premises due to lack of knowledge about covered garbage dustbin and health related disease. Knowledge on covered garbage dustbin and sanitary toilet provide protection from breeding places for flies, which transmit cholera, diarrhoea and the dreadful disease of plague, spreads from garbage heaps and it significantly affect households practice.[30] In India, approximately 74% have no sanitary toilets facility whereas our study had high proportion of toilet facility as comparatively to toilet facility 72 (72%) in which sanitary toilet facility 62 (62%) in Swaroop N et al study and knowledge about sanitary toilet significantly impact on toilet facility within premises.[13, 27] Households without toilet facility commonly used open air defecation and common public latrine nearly similar to use of public latrine 4.6% in whole rural area of Salem district.[31] Open air defecation, a common practice among villagers, may lead to contamination of the water supply system and result in outbreaks of diarrheal disease.[32, 33]

Open air defecation more common in our study than other rural area of Salem district.[31] Open air defecation close to human dwellings contributed to the conversion of large areas of land in and around the village into 'defecation or faecal fields.[12] These 'faecal fields' potentially put the village at risk of flooding with faecal material from surrounding areas during rains. In an adjoining premises, a suspected outbreak of disease was reported after heavy rain because of poorly maintained water supply pipes that ran through a faecal field.[12] Existing Tamil Nadu Water Supply and Drainage (TWAD) Board guidelines specify that the public should not defecate around the tanks and the taps, but is non-specific when it comes to defecation in other places, not accounting for the fact that common defecation areas are usually in the public land where the water supply pipes are laid.[11] Approximately 67 (22.3%) of households were not used footwear for toilet and 7 (7.2%) households didn't used footwear during open air defecation due to almost they were illiterate .

Washing hands after defecation is one of the most effective ways to prevent gastrointestinal parasitic infections.[34,35] A study of Sah R B et al reported (66%) wash their hands with soap water after defecation and remaining others like as Ash, Mud, Plain Water 102 (34%) was same as comparatively to our study in which significant knowledge about sanitary toilet facility affect hand washing practice.[36] In contrast, studies conducted in Colombia and India reported that 82.5% and 86.4% respectively wash their hands after using the toilet.[37,38] The low frequencies of hand washing with soap significantly attributed to the lack of soap at home and toilet facility in premises. Soap, water, and latrines are essential for proper hygiene practice.[39] Even if knowledge exists, sanitary toilet facility within premises significantly affect hand wash after defecation and lack of appropriate resources may negatively affect proper hand washing practices.[36] A study by Cairncross et al uncovered the effect of a supportive household norm on hand-washing behaviour was seen on education activities, exhibitions, health camps, local theatre, films and health clubs contributed to the success of a hand-washing promotion programme.[29]

CONCLUSION

Knowledge regarding drinking water and sanitation among villagers rural area of Salem was good enough but unhealthy surroundings and practices among villagers like as lack of proper toilet facility, poor practice of foot wearing and open air defecation create ideal condition for spread of soil and water transmitted diseases. Health education is very important for better use of existing facilities and also to prevent the incidences of water and sanitation related diseases. Appropriate emphasis is needed to be given to behaviour change communication to create awareness among villagers on the importance of water and sanitation practices by using various media for educate to them.

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APPENDIX

1. Premises: Space with physical boundary where the household lived.

2. Household: A group of persons who normally live together and take their meal from common kitchen unless the exigencies of work prevents any of them from doing so.

3. Income classification: Modified B.G. Prasad revised income categories for all India (IW) 2014 was used for assessment of economic status. Re-categorisation of modified B.G. Prasad revised income categories for all India (IW) 2014 in convenient form for feasibility of study.

Modified B.G. Prasad revised income categories for all India (IW) 2014		Convenient form of modified B.G. Prasad revised income categories for all India (IW) 2014	
Upper class	5357 and above	Upper class	2652 and above
Upper middle class	2652-5356		
Middle class	1570-2651	Middle class	812-2651
Lower middle class	812-1569		
Lower class	811 and below	Lower class	811 and below