

# Water and sanitation hygiene knowledge, attitude, and practices among household members living in rural setting of India

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## Abstract

**Background:** Rural population in developing countries face water, sanitation, and hygiene-related health issues. To objectively highlight these issues, we studied the knowledge, attitude, and practices-related to drinking water and sanitation facilities among the rural population of Chennai, India. **Materials and Methods:** A cross-sectional study was designed involving individuals over 18 years of age living in Thandalam village, Chennai, India. Basic information about sociodemographic profile and existing drinking water and sanitation related knowledge, attitude, and practices was collected using a modified version of previously validated questionnaire and analyzed. **Results:** Forty-five percent of the participants were not following any methods of water treatment and among them half of the participants felt that water available to them was clean and did not require any additional treatment. Twenty-five percent of the participants surveyed did not have access to toilets inside their household. **Conclusion:** There is a need for intervention to educate individuals about drinking water treatment methods, sanitation, and hand washing practices.

**Key words:** Attitude, drinking water, household members, hygiene, knowledge, practices, rural settings, sanitation

## INTRODUCTION

The effects of poor sanitation seep into every aspect of life — health, nutrition, development, economy, dignity and empowerment.<sup>[1]</sup> With a little less than a year left to achieve the millennium development goals, 2.5 billion people are still devoid of improved sanitation facility.<sup>[2,3]</sup> The sanitation target 7C (target 7C: Halve, by 2015, the proportion of the

population without sustainable access to safe drinking water and basic sanitation) to reach 75% of global coverage by 2015 from the present 63% is likely to be missed.<sup>[4]</sup> Globally, water and sanitation hygiene practice are responsible for 90% of diarrhea-related mortality, which is much higher than combined mortality from malaria and HIV/AIDS.<sup>[5-7]</sup>

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Although piped water facility in the rural regions almost doubled in past two decades, there are still 171 million people in rural regions who use surface water as the primary source of water.<sup>[8]</sup> Despite limited improvement in drinking water facilities in rural regions, the trend of the sanitation is still on a slow track, with 66% of the total rural population not having toilet facilities.<sup>[9]</sup>

Limited access to safe drinking water and poor sanitation can lead to under nutrition, water borne diseases, gastroenteropathy along with diarrhea and dysentery. These problems are predominant among preschool children in the developing countries.<sup>[10,11]</sup> Although majority of water borne infections could be treated using antibiotics, the persisting burden of water borne infectious disease and increasing antibiotic resistance has created dual pressure on public health professionals, pharmaceutical industry and policy makers. Interventions for reducing the proportion of people with limited access to clean drinking water can lead to significant economic benefits,<sup>[11]</sup> which can help in achieving sustainable development.<sup>[12]</sup>

Although government agencies are providing the infrastructural support to improve sanitation condition in the developing countries, nevertheless there is a need for collateral personal hygiene and sanitary education to achieve improved outcomes.<sup>[2,3,13]</sup>

Many communicable diseases can be effectively managed by improving the sanitation, hygiene and water usage practices.<sup>[14-18]</sup> However, infrastructure development and policies alone are adequate to fill the existing gap of knowledge and practice of drinking water and sanitation. Nevertheless for effective reduction of effects from poor water and sanitation practices there is a need for understanding the present scenario and the affect of currently existing interventions in the rural settings. Hence, the objective of this study was to understand the knowledge, attitude, and practices related to drinking water and sanitation facilities among the rural population of Chennai, India.

## MATERIALS AND METHODS

A cross-sectional study was designed during September 2013 in the rural setting, Chennai, India. Thandalam village, Chennai, India was selected as study site. 100 households were selected randomly and one member from each household was enrolled as participant. Efforts were made to contact head of the family and in case of his unavailability next immediate available resident was contacted for the interview. The participants had to be over 18 years of age and residing in rural areas. Participants were informed about the study objectives

and those eligible and giving a written informed consent were enrolled in this study. Individuals who were mentally or physically challenged were excluded from participating in the study. The study protocol was approved by the Institutional Review Board (IRB) of the Foundation of Healthcare Technologies Society (FHTS), New Delhi (IRB#FHTS/006/2013). Confidentiality of all the participants was maintained by assigning unique code to each of the participants.

### Data collection tools

A modified questionnaire was prepared from the existing validated tools. It consisted of following content.

#### *Sociodemographic characteristics*

Information was gathered about age (years), gender, educational status (no formal education, primary [1-5<sup>th</sup> grade], middle [6-8<sup>th</sup> grade], high school [9-10<sup>th</sup> grade], intermediate [11-12<sup>th</sup>] or equivalent, graduate or postgraduate), marital status (single/married/divorce or separated/widow), annual household income, type of family (joint, nuclear, broken, extended), number of family members, and occupation status (professional, semi-profession, clerical, shop owner, farmer, skilled worker, semi-skilled worker, unskilled, unemployed).<sup>[19]</sup>

#### *Water facility and related issues*

Information was gathered about the various sources of drinking water, individuals that were responsible for fetching water in household, periods of water shortage, distance of water source from household, water supply timings and water storage practices.

#### *Water treatment and storage practices*

Information was gathered about participant's attitudes toward water treatment practices. Water safety, effects of unsafe drinking water on health, and the practices that were adopted to make water safe to drink related topics were included.

#### *Sanitation and related health issues*

Information was gathered about toilet facilities, hand washing, waste disposal facilities and quantity of water being used in the house for various purposes (drinking, cooking, and ablutions, washing clothes, house cleaning, and miscellaneous). Additional information was sought regarding any diarrheal episode has occurred in the family in past 3 months.

Additional information was gathered through open-ended questions about challenges faced by the participants to fetch water, their satisfaction toward existing water and sanitation facilities.

### Statistical analysis

Descriptive analysis was performed using univariate statistics to report means and standard deviations (SDs) for the continuous variables and frequency distribution for the categorical variables. All analysis was performed using SPSS version 16 (SPSS Inc., Chicago, USA).

## RESULTS

The average age of participants was 39 years (SD = 9.7), Majority of them were females (71%), 74% of them were married and 68% of them were living in nuclear families with average family size of 4 (SD = 2). Thirty-six percent of the participants had intermediate (12<sup>th</sup> grade) or above level of education. Half of the participants were unemployed with average annual household income of Indian National Rupee 89,175 (SD = 13,179) [Table 1]. The major sources of water procurement were public tap/stand pipe (42%) and tube well/borehole (37%). Sixteen percent of the participants were dependent on private water supply. Figure 1 presents the source of water utilized for different activities. Daily consumption of water for various activities varied considerably [Figure 2]. Ninety-five percent of the participant's fetched water within premises and majority of them (81%) required <5 min for fetching water from the water outlet. Majority of the participants (85%) fetching water were women in the age group of 15-60 years. Majority of the participants (98%) reported meeting the daily need of water quantity. Nineteen percent of the participants reported water shortage twice in a year with average shortage period of 2-3 days (25%). Seventeen percent of the participants indicated July-September as water shortage months while 14% suggested April-June. Half of the participants (53%) reported morning and evening supply of water with uncleanliness (26%) as one of the predominant problem [Table 2].

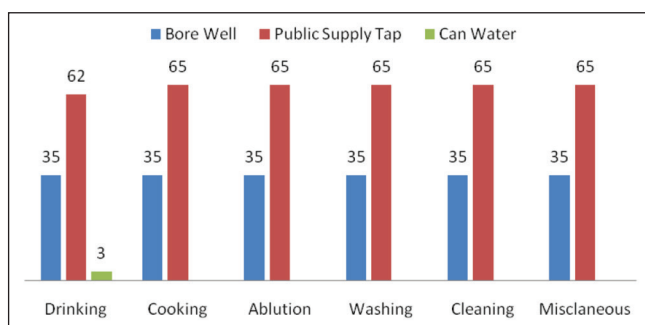
Majority of the participants (95%) perceived that the quality of water being used was safe, 71% of the participants agreed that quality of water can

affect health status, 75% of them stored drinking water in wide mouth closed container and most of them cleaned water container daily (70%). Forty-five percent of the participants were not following any methods of water treatment and among them half of the participants felt that water was already clean and did not require any additional treatment. Half of the participants (51%) agreed that unsafe drinking water can cause general fever, whereas 22%, 18%, and 16% of the participants reported common cold, diarrhea, and vomiting respectively as potential consequence of drinking unsafe water. Water supply timing was the biggest challenge faced by the majority (94%) of the participants [Table 3]. Twenty-five percent of the

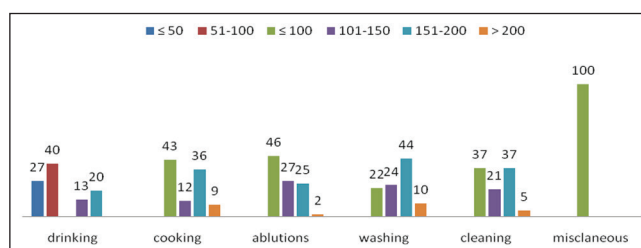
**Table 1: Sociodemographic characteristics of the participants**

Variables	Frequency (%)
Age (years)	Mean=39; SD=15
Gender: Female	71
Type of family	
Joint	32
Nuclear	68
Total number of household members	Mean=4; SD=1.7
1-2	20
3-4	51
≥5	29
Annual household income (INR)*	Mean=89,175; SD=131,792
≤50,000	50
50,001-100,000	33
≥100,001	14
Missing	3
Marital status	
Married	74
Single	20
Widow/widower	6
Highest education level of participant	
No formal education	13
Primary (1-5 <sup>th</sup> grade)	7
Middle (6-8 <sup>th</sup> grade)	13
High school (9-10 <sup>th</sup> grade)	31
Intermediate (11-12 <sup>th</sup> ) or equivalent	21
Graduate or postgraduate	15
Occupation	
Unemployed	52
Skilled worker	23
Unskilled worker	23
Missing	2

\*INR: Indian national rupee, SD: Standard deviation



**Figure 1: Source of water used for different daily activities by individuals living in Thandalam village of Chennai, India**



**Figure 2: Quantity of water (L) required for various activities by individuals living in Thandalam village of Chennai, India**

**Table 2: Existing water facilities and associated issues in Thandalam village of Chennai, India as reported by the participants**

Variables	Frequency (%)
Source of drinking water	
Piped water into dwelling	15
Piped water to yard/plot	5
Public tap/stand pipe	42
Tube well/borehole	37
Tanker-truck (municipal/private)	1
Water supplier in your community	
Government/public	83
Private	16
None	1
Time consumed in bringing water from source	
5 min	81
<30 min	3
>30 min	16
Distance of source	
Within premises	95
Outside households	5
Individual fetches the water from the source for your household majority of times <sup>‡</sup>	
Girls <15 years	1
Women 15-60 years	85
Men 15-60 years	6
Men >60 years	2
Women >60 years	5
Do you feel the quantity of water you collect fulfills yours daily requirement?	
Yes	98
No	1
Not sure	1
How many times in a year do you face drinking water scarcity?	
Once	4
Twice	19
Thrice	2
No shortage	62
More than 3 times	13
Average time period of water shortage	
<1-day	2
1-day	6
2-3 days	25
Not applicable	2
More than a week	6
Do not know	59
Which periods of year do you face maximum water shortage?	
January-March	1
April-June	14
July-September	17
None	66
Always	2
What are the timings of water supply?	
Morning	31
Evening	2
Morning and evening	53
Round the clock	11
Irregular	3
What are the problems you usually face in the water supply?	
Irregular	4
Unclean	26
Too far	1
Dirty water	6
Saline	2
None	61

<sup>‡</sup>Responses are in multiple scales**Table 3: Perceptions and practices-related to drinking water storage and safety among the study participants**

Variable	Frequency (%)
Where do you store drinking water?	1
Narrow mouth open container	1
Narrow mouth closed container	23
Wide mouth closed container	75
How often do you clean storage container?	
Before fetching water	5
When it is dirty	1
Every day	70
Every week	10
Every month	8
Missing	6
Do you think the water you use is safe for the household to drink?	
Yes	95
No	3
Do not know	2
Do you think quality of water can affects health?	
Yes	71
No	28
Do not know	1
What are the effects of using unsafe drinking water on human health? <sup>‡</sup>	
General fever	51
Common cold	22
Diarrhea	18
Vomiting	16
Cholera	7
Malaria/dengue	6
Do not know	9
Other diseases	16
Do you know any person who has suffered due to use of unsafe drinking water?	
Family member	1
Friends	7
Do not know	4
None	88
What do you usually do to the water to make it safer to drink? Anything else?	
Nothing	45
Boil	22
Add bleach/chlorine	4
Strain it through a cloth	4
Use a water filter (ceramic, sand, composite, etc.)	25
What are the reasons for not treating water?	
Water is already clean/safe	22
Do not know how to do it	3
Expensive	5
Treated water does not taste good	14
Missing	1
What are the biggest challenges do you face in procuring drinking water?	
Timings	94
Distant source	6

<sup>‡</sup>Responses are in multiple scales

participants did not have access to toilets inside the households. Seventy-nine percent of the participants had access to septic tank type of toilets. The majority of the participants agreed that hand should be washed before and after meals, while only 32% felt that hand

should be washed after defecation. Results showed that 17% of the participants used plain water or water with ash to clean their hands while majority of the participants washed their hands to prevent infection (82%) or for hygiene maintenance (76%). Forty-seven percent of the participants reported that they discharge their waste in open drainage [Table 4]. Sixty-two percent of the participants desired for filter water and 38% of them desired for boiled and safe water facilities from the suppliers. Most of them had reported improper

sanitary facilities and stressed on the need of sanitary education [Table 5].

## DISCUSSION

Water is one of the precious natural resource and is essential element of our life. Clean water and optimum sanitation facilities can prevent the occurrence of various infectious diseases and help in curbing the associated morbidity and mortality. The current study was conducted in rural setting of India to understand the existing water and sanitation facilities, perceptions and practices. Majority of the participants used public tap/stand pipe for water procurement and most of them had water supply inside their household premises. Females of age between 15 and 60 years were the primary responsible person for fetching water, which is consistent with previous report.<sup>[20]</sup> Most of the participants were consuming 151-200 L of water daily for cleaning and washing and  $\leq 100$  L of water for drinking, cooking and ablutions. Most of the participants reported that their daily needs of water quantity were met by the current supply.

About one in five of the participants reported water shortage twice in a year with average shortage period of 2-3 days. A previous study on water quality of groundwater resources showed that the water quality index of bore well, dug well and hand pump declined in postmonsoon season<sup>[21]</sup> which may account for water shortage. In addition, impurity in supplied water was one of the predominant problems, reported by one-fourth of the participants while the majority of the participants felt that the quality of water being used was safe. Majority of the participants were aware of the effects on health due to quality of water and half of them agreed that the consumption of unsafe drinking water may lead to one or more infectious diseases. Despite the knowledge 45% of the participants were not following any methods of water treatment and among them half of the participants felt that water is already clean, hence no further treatment was necessary.

One-fourth of the total participants were devoid of toilets facilities inside their households; leaving them with the options of using community toilets, open defecation or sharing the toilets with other households which in turn promotes the increase in incidence of water-borne disease. Although, the majority of the participants knew and reported hand washing before and after meals only one in three participants felt that hand should be washed after defecation. It was also observed that few of the participants used plain water for hand washing after defecation. This is again consistent with the previous report.<sup>[22]</sup> This kind of practice may give rise to diseases of the feco-oral route and increase the financial burden in terms of hospital

**Table 4: Existing sanitation facilities and related practices followed by the participants**

Variables	Frequency (%)
Kind of toilet/latrine facility used	
Household	75
Community	7
Open field defecation	17
Shared	1
What kind of toilet facility/facility for defecation used in your household?	
Flush/pour flush to piped sewer system	4
Septic tank	79
Elsewhere	2
No facilities bush or field	15
Where do you usually dispose the feces of children <3 years?	
Left in the open	4
Put/rinsed in a drain/ditch	1
Thrown into garbage/solid waste	5
Buried	1
Used toilet/rinsed in toilet	4
No child <3 years	85
What, in your opinion, are the critical times of hand washing?†	
Before food	96
After food	94
After defecation	32
After weaning child	1
After house cleaning	1
When do you wash your hands?†	
Before eating	95
After eating	68
After defecation	20
Before handling food	8
After house cleaning	1
Material used for hand wash	
Water and soap	83
Water only	15
Water and ash	2
Reasons for washing hands†	
Health: Prevent infection	82
Hygiene	76
Appears good	5
Because everyone does	1
Where is the waste water discharged?	
Open drainage	47
Closed drainage	37
Community drainage	3
On the roads	9
No fixed pattern	2
To the field	2

†Responses are in multiple scales

**Table 5: Challenges and suggestions for water, sanitation and hygiene**

Variables	Frequency
What are the challenges faced by you for water procurement?	
Strict timings	99
Salty water	1
Satisfaction toward existing community water services	100
What kind of facilities should be provided for safe and adequate water supply for the community?	
Filter water	62
Boiled and safe water	38
Current condition regarding sanitation	
No proper sanitation	17
No proper sanitation and sanitary education is needed	49

admissions and associated medical expenses. School attendance of children would be affected as their role changes from studying to care provider for an elderly sick person in the family; in addition to children falling ill due to similar hand washing practices.

On assessing the need of water, sanitation, and hygiene; most of the participants desired for filter water and 38% of them desired for boiled and safe water facilities from the suppliers. Most of the participants stressed on the need of sanitary education. Nevertheless, there are some limitations associated with our study. First it included smaller sample size and the study design was cross-sectional. Further the study was limited to one geographical location; hence, the results of the study should not be generalized. However, our study does identify the need for intervention program to educate the population regarding sanitation, water treatment methods, and hand washing practices. There is also a need for developing cost effective water testing devices to record seasonal variations in water quality in rural areas.

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### Conflicts of interest

There are no conflicts of interest.

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