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Original research article

Drinking water and sanitation: household survey for knowledge and practice in Bihar

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Abstract

Background: Water is basic human right, most precious resource for economy and health. Drinking water and sanitation is a fundamental health service. The health of a person largely depends on its quality and quantity of safe water. Water must be safe and wholesome. But unfortunately the problem of water pollution has now become a burning question.

Material and methods: This community based cross sectional study was done in rural Areas in kishanganj District, Bihar, India for 8 months . The sample size of the study was finalized to 200 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.

Results: 60 (30%) of them were illiterate, out of whom 110 (55%) of families belonged to middle class and 50(25%) of families belonged to the upper socioeconomic class .Most of households had knowledge about the importance of covered drinking water 190 (95%) followed by clean drinking water 174 (87%), cleaning of river/pond water 140(70%), covered garbage dustbin 126(63%), sanitary toilet 170 (85%) and hand wash after toilet 190(95%). A total of 200 households were visited for the study purpose. Most of the respondents were adult females 100(50%) 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 74 (37%). Knowledge of clean drinking water was significantly related with practice of covered water 164 (82%), distance of source 180 (40%), cleaning and disinfectant for water 190 (95%). Similarly, knowledge regarding covered drinking water 180 (90%) and Rivers/Ponds water 140 (70%) was significantly associated with practice of cleaning and disinfectant for drinking water.

Conclusion: 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] 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] Water must be safe and wholesome. It should be easily accessible, adequate in quantity, free from contamination, safe and readily available throughout the year.[3] Positive health is not possible without safe water. But unfortunately the problem of water pollution has now become a burning question. Much of ill health that affect humanity is due to lack of safe water supply, particularly in the developing country like ours.[4] The incidence of water borne diseases like typhoid, paratyphoid, diarrhea, dysentery, cholera, parasitic infestations etc. are increasing day by day. These problems can be drastically reduced by raising awareness among people and providing them safe drinking water.[5] Water is the basis of life and blue arteries of the earth. Everyone in the environment depends on fresh water to survive.[6] Villagers are not conscious about the importance of drinking safe water. As a result, they are suffering from various water borne diseases.[6] It is an urgent need to educate them in order to develop the habit of drinking safe water. They should be encouraged to drink water from safe sources and purify water before drinking by various methods of water purification such as boiling, chlorination, filtration etc. when safe sources are not available. Because- "water is the blood in our veins".[7] It is not possible to develop the habit of drinking safe water in 100% people but the percentage can be increased by raising consciousness among them about the importance of drinking safe water and providing them information about various methods of water purification. Because they must be aware of that- "Water is the oil of 21 century".[8]

The habit of drinking safe water among the people of whole country as it has been carried out in a small community among small number of people. So it does not reflect the actual scenario of the country. But it creates a scope to conduct repeated study in this field. The quality of drinking-water is a powerful environmental determinant of health.[9] Drinking-water quality management has been a key pillar of primary prevention for over one-and-a-half centuries and it continues to be the foundation for the prevention and control of water borne diseases. To ensure availability of safe drinking water supply, reliance has to be placed on regular bacteriological analysis to assess portability and to determine the best course of action for protecting the population against waterborne diseases (Ramteke & Bhattaacherjee, 1992). In 1998, the National Policy for Safe Drinking Water Supply and Sanitation (NPSWSS) was published. The main objective of this policy is to improve public health and produce a safe environment by reducing water borne disease and contamination.[10]

Material and methods

This community based cross sectional study was done in rural areas in Kishanganj District, Bihar, India for 8 months.

Methodology

The sample size of the study was finalized to 200 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.

Results

60 (30%) of them were illiterate, out of whom 110 (55%) of families belonged to middle class and 50(25%) 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 190 (95%) followed by clean drinking water 174 (87%), cleaning of river/pond water 140(70%), covered garbage dustbin 126(63%), sanitary toilet 170 (85%) and hand wash after toilet 190(95%) as shown in table (2).

A total of 200 households were visited for the study purpose. Most of the respondents were adult females 100(50%) 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 74 (37%).

Table 1: Distribution of study subjects by sociodemograhic characteristic (n=200).

Sociodemograhic characteristics		**Frequency (n)**	**Percent (%)**
Age	20-40	100	50
	40-60	70	35
	Above 60	30	15
Sex	Male	96	48
	Female	104	52
Education	illiterate	60	30
	High school	112	56
	> High school	28	14
Occupation	unemployed	60	30
	skilled	84	42
	unskilled	74	37
Socioeconomic class	Lower class	40	20
	Middle class	110	55
	Upper class	50	25
Total		200	100

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

Knowledge	**N=200**	**No. of houses (n)**	**Percentage (%)**
Drinking water should be covered	Yes	190	95
	No	10	5
Clean drinking water should be used	Yes	174	87
	No	26	13
Rivers/Ponds water should be clean	Yes	140	70
	No	60	30
Garbage dustbin should be covered	Yes	126	63
	No	74	37
Sanitary Toilet should be used	Yes	170	85
	No	30	15

Hand wash after toilet	Yes	190	95
	No	10	5
Total		200	100

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

Hygienic practice	**N=200**	**No. of houses (n)**	**Percentage (%)**
Drinking water was found cover	Yes	186	93
	No	14	7
Source of drinking water	Pipe line water	168	84
	Others*	32	16
Pipe line water = tube well, tape water, hand pump, Others* = River/pond/lake			
Distance of source of drinking water	Within premises outside of premises	92 108	46 54
Water	Boiling	88	44
purification	Others**	76	38
method	None	36	18
Others** = Chlorine tab., Cloth filtration, RO System			
Garbage	Yes	90	45
dustbin was covered in premises	No	110	55
Garbage was	Yes	118	59
found openly in premises	No	82	41
Toilet facility was available	Toilet within premises	122	61
	Open air defecation	64	32
	Community toilet	14	7
Foot wear used for toilet	Yes	158	79
	No	42	21
Hand washing after toilet	Soap water	130	65
	Others***	70	35
Others*** = Ash, Mud, Plain Water			
Total		200	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 186 (93%) and majority households 168 (84%) collected water for drinking purpose from pipeline followed by remaining others 32 (16%). They were travelling for fetching drinking water 108 (54%) outside of premises followed by 92 (46%) within premises. It was seen that majority 88 (44%) households used boiling method for purification of drinking water followed by 76 (38%) of

them treat drinking water by other methods and 36 (18%) households did not use any treatment for purification of water. Average 110(55%) households had uncovered garbage dustbin, garbage found openly in premises 118 (59%) and households were had a toilet facility within premises 122 (61%) of which toilets were sanitary 108 (54%), households without toilet facility who used open air defecation 64(32%), households did not use footwear for toilet 42 (21%), households washed their hands after toilet with soap 130 (65%) and remaining by others like as Ash, Mud, Plain Water 70 (35%).

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

Practice		**Knowledge**			**CI = 95%**	
		Yes (%)	No (%)	Total (%)	□2	P value
		Clean drinking water should be used				
Drinking water was found	Yes	164 (82)	22 (11)	186 (93)	29.88	0.00
cover	No	6 (3)	8 (4)	14 (7)		
Distance of source of water	within premises	180 (40)	12 (6)	92 (46)	7.22	0.006
	Outside of premises	84 (42)	24(12)	108 (54)		
Water	Boiling	82 (41)	6 (3)	88 (44)	1.69	0.00
purification	Others	72 (36)	4(2)	76 (38)		
method	None	15(7.5)	21 (10.5)	36(18)		
Others** = Chlorine tab., Cloth filtration, RO System						
Drinking water should be covered						
Drinking water was	Yes	180 (90)	6 3)	186 (93)	54.87	0.00
found cover	No	9 (4.5)	5(2.5)	14 (7)		
Rivers/Ponds water should be clean						
Water purification method	Boiling	72 (36)	16(8)	88 (44)	67.68	0.00
	Others	60 (30)	16 (8)	76 (38)		
	None	16 (8)	20(10)	36(18)		
Garbage dustbin should be covered						
Garbage dustbin was	Yes	76 (38)	14 (7)	90 (45)	81.74	0.00
covered in premises	No	40(20)	70 (35)	110 (55)		
Garbage was found openly	Yes	68(34)	50(25)	118 (59)	9.36	0.002
in premises	No	56(28)	26(13)	82 (41)		
Sanitary Toilet should be used						
Toilet within premises	Yes	117 (58.5)	5 (2.5)	122 (61)	73.42	0.00
	No	33 (16.5)	31 (15.5)	64 (39)		
Hand wash after defecation	Soap	110(55)	20 (10)	130(65)	9.97	0.002
	Others	50 (25)	20 (10)	70 (35)		
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 164 (82%), distance of source 180 (40%), cleaning and disinfectant for water 190 (95%). Similarly, knowledge regarding covered drinking water 180 (90%) and Rivers/Ponds water 140 (70%) 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 76 (38%) and garbage found openly in premises 68 (34%). Likewise knowledge of sanitary toilet was significantly associated with practice of toilet within premises 117 (58.5%) and hand wash after defecation 110(55%). Table (5) was showing hygiene practice significantly related to toilet facility. Toilet within premises 81 (40.5%) and sanitary toilet within premises 131 (65.5%) had shown significant association with soap hand washing practice.

Table 5: Association of respondents on hygienic practice

Hand wash after defecation					**CI = 95%**	
		Soap (%)	Others (%)	Total (%)	□2	P value
Toilet within Premises	Yes	81 (40.5)	41(20.5)	122 (61)		
	No	40(20)	38 (19)	78 (39)	6.29	0.015
Sanitary toilet within premises	Yes	131(65.5)	43(21.5)	174 (87)		
	No	6 (3)	20 (10)	26 (13)	18.22	0.00
Others*** = Ash, Mud, Plain Water						

Discussion

Provision of drinking water has been of primary concern in rural India.[11,12] 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.[13] 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.[14]

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.[15] Study reported that most of respondents had knowledge about importance of covered drinking water in prevention of diseases that was nearly similar to 96% in study by Bharti et al.[16] 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.[17] 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.[18] 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.[15] 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.[19] 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.[15] 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.[14,20,21] Water is pumped every day but the current TWAD Board guidelines specify that chlorination should be done once a month, thus requiring modification.[13] 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.[22-25]

Considering the contamination of all water samples at the household level, end-user disinfection is likely to be more effective in such settings.[26] However, such methods may not be sustainable over longer periods or may not be cost- effective in rural India [27]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.[28,29] 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.[30] Approximately 36 (18%) 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 [31] Bhattacharya et al. also found 72% of household don't follow any treatment and drink it as it.[32] 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.[33]

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.[34] 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[15,31] 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.[35] Open air defecation, a common practice among villagers, may

lead to contamination of the water supply system and result in outbreaks of diarrheal disease.[36,37]

Open air defecation more common in our study than other rural area of Salem district.[35] 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.[14] 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.[14] 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.[13] Approximately 42(21%) of households were not used footwear for toilet and 16 (8%) 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.[38,39] 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.[40] In contrast, studies conducted in Colombia and India reported that 82.5% and 86.4% respectively wash their hands after using the toilet.[41,42] .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.[43] 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.[40] 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.[30]

Conclusion

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.

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