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RESEARCH ARTICLE

Accessibility, Availability and Potability of drinking water in rural households of Udupi Taluk, Karnataka, India-2012

Ramamchandra Kamath, Sharad Sawai, Saurabh Kumar

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Corresponding Author
Dr. Ramamchandra Kamath

Abstract

Background: The water and sanitation are one of the primary drivers of public health. About 1.1 billion people in the world were lacking access to the safe drinking water supply in 2002 and 86% of these people were living in rural areas.

Objectives: Primary: To assess the bacteriological potability of drinking water by H2S method. Secondary: To assess the availability and accessibility of drinking water.

Settings: The study was conducted in rural households of Udupi taluk, District Udupi, Karnataka. It was a community based cross sectional study.

Materials and Methods: The study was conducted in the year 2012 using Bactoscope- water potability kit and interview schedule. A total of 180 households were interviewed and sample of drinking water was collected from each of the households using two stage sampling.

Analysis: The analysis was done using SPSS 15 statistical package. The results were expressed in percentages and proportions. Chi square test was applied to find any association with bacteriological potability of water

Results: 52.8% of the household were using bacteriologically non potable water for drinking purposes. Below poverty line and katcha or semi pucca house was significantly associated with bacteriologically potable water. 62.8% of the households were collecting the water from open wells. 98.3% of households reported that drinking water is available round the year and majority of them collected the water from the source on a daily basis

Conclusion: Though the drinking water is readily available and easily accessible for majority of the household, the high prevalence of non potable water is an issue of grave concern.

INTRODUCTION

Globally, 19 % of deaths due to infectious diseases stem from water, sanitation and hygiene risk factor. This amounts to 3.4 million deaths per year, two thirds of which are caused by diarrhoea, a disease that claims the lives of more than 2.2 million people every year. Of those who die, most are children in developing countries.[1]

The South-East Asia Region (SEAR) bears a disproportionate burden of global diarrhoea mortality: SEAR countries account for nearly one million deaths per year due to diarrhoea, or 43% of the total worldwide.[1]

The water and sanitation are one of the primary drivers of public health. About 1.1 billion people in the world were lacking access to the safe drinking water supply in 2002 and 86% of these people were living in rural areas. [2]

The provision of clean drinking water has been given priority in the Constitution of India, with Article 47 conferring the duty of providing clean drinking water and improving public health standards to the State. [3]

Safe drinking water is water considered safe if it meets certain microbiological and chemical standards on drinking water quality; Access to safe drinking water is measured against the proxy indicator: the proportion of people using improved drinking water sources: household connection; public standpipe; borehole; protected dug well; protected spring; and rainwater collection. [4]

The issue of potability, reliability, sustainability, convenience, equity and consumers preference should be the guiding principles while planning for a community based water supply system.[5]

Bacterial contamination of water continues to be a widespread problem across the country and is a major cause of illness and deaths with 37.7 million affected by waterborne diseases annually. [3].The major pathogenic organisms responsible for water borne diseases in India are bacteria (*E Coli, Shigella, V cholera*).

WHO estimate that 94% of diarrhoeal cases are preventable through interventions to increases the availability of clean water, and to improve sanitation and hygiene. [6]

The objectives of the study were to assess the bacteriological potability of drinking water by H_2S method and also to assess the availability and accessibility of drinking water**.**

Materials and Methods

The analysis is based on data collected from a cross sectional survey of rural households in a two stage sampling method which was carried out from April 2012 to August 2012 in Udupi taluk of District Udupi. Udupi taluk is one among three taluks of district Udupi (Karkala, Kundapura and Udupi), situated in coastal Karnataka, a state in southern India.

Taking the prevalence of non potable water as 60.5% relative precision at 15% & including a non-response rate of 10%, sample size needed for the study came to be 174.

Two stage sampling technique was adopted for the study. Total number of villages in rural area of Udupi taluk was 99. 18 villages were selected randomly by lottery method in the first stage. In the second stage, 10 households were selected in each village. First house in village select was selected randomly followed by selecting nine houses in clockwise direction.

The study was mainly focused on two parts – questionnaire survey for availability and accessibility of drinking water and bacteriological analysis for water samples by H_2S method. The primary data was collected with the help of a pre-structured and pre-designed questionnaire. Further, information was collected regarding socio-demographic profile.

"Bactoscope- water potability kit" was used for collecting and testing the water sample.[7] A sealed bottle was used to collect water from household which was opened in presence of respondent. Holding the base of bottle, the water sample was taken from household storage vessel which was using for drinking purpose. The glass container was covered with the cap and sample number was labelled. Further Glass bottle was kept into kit box to avoid contact with external environment. Hand gloves were used throughout this procedure. The colour of the water was observed for 18-24 hours. If water colour did not change and remained golden brown, this indicated that water was safe for drinking purposes and if water sample turned the sample was considered contaminated with harmful bacteria and was labelled not safe for drinking.

Information was gathered on socio-demographic profile, primary source of drinking water, availability of drinking water, quantity used for drinking purpose, water storage of drinking purpose, reasons for storage of drinking purpose, stored water duration, enough utensil for storing water, water storage place, cleaning of vessels, water scarcity etc. using an interview schedule. The interview schedule was administered to one respondent in each household in the local language.

The data so collected was entered in SPSS 15 statistical package.

The ethical clearance for the study was obtained from the institutional ethical committee. The informed consent was obtained from the participants before starting with interview.

Results:

A total of 180 households and respondents were surveyed and interviewed respectively during the study.
A vast majority of respondents 152(84.4%) were belonging to Hindu religion and 172 (95.6%) were staying in their own residence respectively. Within the region one third of the respondents only were living in pucca houses. Nearly two thirds of the households were found to be above poverty line. [Table 1]

65.5% of the households were collecting water from open wells. The availability of the water for nearly all the households was throughout the year and majority of them were collecting it on a daily basis 132(73.3%). Nearly 4/5th of the households were collecting upto 6 pots of water on a daily basis from the water source and the most common reason for use of a water source for collecting water was reported to be as near to the house.
Nearly all the surveyed households had enough containers for storage of drinking water. In the majority of the households water was being stored for just one day only and the containers were being cleaned on a daily basis respectively.[Table 1b]

Out of 180 households surveyed, majority of households 95 (52.8%) had bacteriologically non-potable drinking water. Significantly higher proportion of households with kutcha houses were having non potable water compared to semi pucca and pucca type of houses. Below poverty line socioeconomic status was also found to be significantly associated with the presence of non potable drinking water. Religion, type of water source, frequency of collection of water from source and storage were not found to be associated with non potable water. [Table 2]

Table 1a: Distribution of study population according to Accessibility, Availability of drinking water in the rural areas of Udupi Taluk, 2012

Variable	Groups	Frequency (Percentage)
Type of Water Source	Open well	118 (65.5%)
	Bore well	13 (7.2%)
	Hand pump	3 (1.7%)
	Public tap	34 (18.9%)
	Piped water supply	12 (6.7%)
Water Source Availability	throughout the year	177 (98.3%)
	Only rainy season	3 (1.7%)
Collection of drinking water from water source	Daily	132 (73.3%)
	Once in 2-3 days	48 (26.7%)
Quantity of Water for Drinking Purpose	1-3 pots	71 (39.4%)
	4-6 pots	78 (43.3%)
	7-9 pots	17 (9.4%)
	10-12 pots	9 (5%)
	More than 13 pots	5 (2.8%)
Reason use as primary source of drinking water	Near the house	100 (55.6%)
	Water is clear	2 (1.1%)
	Cooking fast and good	1 (0.6%)
	Taste is good	2 (1.1%)
	Govt. supply of water	39 (21.7%)
	No alternative	36 (20%)

Table 1b: Distribution of study population according to Accessibility, Availability of drinking water in the rural areas of Udupi Taluk, 2012

Reason for water storing	Water source too far away	17 (9.4%)
	Irregular supply	38 (21.1%)
	It is easier	125 (69.4%)
How long do you Store Water	1 Day	127 (70.6%)
	2-3 Day	53 (29.4%)
Enough utensils for Storing Water	Yes	176 (97.8%)
	No	4 (2.2%)
Where do you store Drinking Water	Buckets	2 (1.1%)
	Pots	59 (32.8%)
	Outdoor tank	9 (5%)
	Drum inside the house	110 (61.1%)
Clean the vessel for storing water	Daily	117 (65%)
	Once in two days	51 (28.3%)
	Twice in week	4 (2.2%)
	Weekly once	8 (4.4%)

Table

Variable	**Prevalence of potable water**	**Prevalence of non-potable water**	**Chi-square test**
Religion of household			
Hindu	69 (45.4%)	83(54.6%)	$\chi^2 = 1.309$ df=1, p= .253
Others	16 (57.1%)	12 (42.9%)	
Economic class			
Below poverty line	26(37.1%)	44(62.9%)	$\chi^2 = 4.669$ df=1, p= . 031
Above Poverty line	59(53.6%)	51(46.4%)	
Condition of the house (building)			
Kutcha	22(36.1%)	39(63.9%)	$\chi^2 = 5.320$ df=1 p = .021
semi pucca	33(49.3%)	34(50.7%)	
Pucca	30(57.7%)	22(42.3%)	
Type of water source			
Open well	53(44.9%)	65(55.1%)	$\chi^2 = .732$ df=1 p = .392
Others	32 (51.6%)	30 (48.4%)	
Collection of drinking water from water source			
Daily	68(51.5%)	64(48.5%)	$\chi^2 = 3.660$ df=1 p = .056
Once in 2-3 days	17(35.4%)	31(64.6%)	
How long do you store water			
1 Day	65(51.2%)	62(48.8%)	$\chi^2 = 2.712$ df= 1 p = .100
2-3 Day	20(37.7%)	33(62.3%)	
How often do you clean the storage containers			
Daily	58(49.6%)	59(50.4%)	$\chi^2 = .741$ df= 1 p = .389

2. Association between sociodemographic variables, availability, accessibility of water and potable water in the rural areas of Udupi Taluk, 2012

Discussion

According to CENSUS REPORT (2001) 68.2 per cent of households in India have access to safe drinking water. According to latest estimates, 94 per cent of the rural population and 91 per cent of the people living in urban areas have access to safe drinking water. Data available with the Department of Drinking Water Supply shows that of the 1.42 million rural habitations in the country, 1.27 million are fully covered (FC), 0.13 million are partially covered (PC) and 15,917 are not covered (NC). While accessing drinking water continues to be a problem, assuring that it is safe is a challenge by itself. Water quality problems are caused by pollution and over-exploitation. [3]

We observed that nearly 52.8% of the households surveyed had bacteriologically non potable water which is definitely high above the national average as mentioned above. The high prevalence of non potable water was even reported by Goel S etal[8], Malviya Net al[9]. which pointed out that surface and ground water sources in those regions were contaminated. It applies to some extent in our study but since water samples were taken from the place of storage in the households and not from the source directly. This reflects the problems in the storage or purification procedures done by the households.

It was also found in our study that socioeconomic status was associated with non potable water. Respondents who were living below poverty line were more likely to have non potable drinking water in their households. Further, significantly higher proportion of households with kutcha houses were having non potable water compared to semi pucca and pucca type of houses which was similar to the study by Shamsher Samra et al. (2006). [10] Low socioeconomic status may be responsible in the way the households collect, store and handle water leading to contamination or directly accessing contaminated water and not treating adequately either due to lack of knowledge or lack of resources.

With regard to availability and accessibility of water, 65.5% of the households were collecting water from open wells. This is in concordance with the findings of Ashwas-A Survey of Household Water And Sanitation Karnataka — 2008-09 which showed that, in Udupi district, 12% - public tap, 4% - mini water supply, 1% - river and 83% - open well were used as primary water source by people. [11] The availability of the water for nearly all the households was throughout the year and majority of them were collecting it on a daily basis i.e. 132(73.3%) which is quite usual. Nearly all the surveyed households had enough containers for storage of drinking water. In the majority of the households water was being stored for just one day only and the containers were being cleaned on a daily basis respectively. Inspite of this the prevalence of bacteriologically non potable water was found to be on the higher side in our study. The probable reason which should be looked into the future is on the ways of water treatment in the households, handling of the water storage containers while withdrawing water and also importantly the water analysis of the various water bodies

The limitations of the present study were of only having qualitative bacteriological analysis of water (H2S producing bacteria) without quantitative and chemical analysis. Further research is needed to find out any association between various morbidities amongst the people and the non potable water to draw the attention of the concerned authorities.

Conclusion:

Though the drinking water is readily available and easily accessible for majority of the households, the high prevalence of non potable water is an issue of grave concern. The study points about the contamination of water with fecal material in the majority of the households. The probable sites of contamination may be at either the source or in handling/treating of water. There is an increasing need of focusing on health education activities in the rural areas especially for the below poverty line households on the techniques of treating the water in the house so that it is safe enough to drink.

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