A Study Of Socio-Cultural Factors, Water Quality And Diarrhea In Bangalore

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Abstract

The study was aimed to find the socio--cultural factors in relation to acute diarrhea andbacteriological quality of water in households with diarrhea and time trend of diarrhea. 150 houses in each of the two areas, one supplied by bore well and the other by Bangalore Water Supply and Sewage Board[BWSSB] water selected by modified cluster sampling. Weekly morbidity details were collected and water samples assessed from diarrhea reported houses. The study revealed an incidence rate of diarrheal diseases of 3.2%. It was also noted that children less than 5 years showed an incidence of 38.89% and 57.14% in bore well and piped water supply areas respectively. Peak incidence of diarrhea was observed in the month of November. From our study it was inferred that the practices such as washing vessel, hygienic transportation, storage and drawing of water, and pretreatment of drinking water among the individuals with morbidities in the two areas were considerably different. Thus the study recommends improved water quality at point of use along with promotion of better water handling during collection, storage and treatment can produce better health outcomes.

INTRODUCTION

Water related diseases continue to be one of the major health problems globally. Everyday water related diseases cause death of thousands of children, untold sufferings and loss of working time. 88% of diarrheal disease is attributed to unsafe water supply, inadequate sanitation and hygiene. Hygienic interventions including education and promotion of hand washing can lead to reduction in diarrheal cases by up to 45%. [1] Diarrheal diseases kill an estimated 1.8 million people each year. [2].Among children under five years in developing countries, diarrhea accounts for 17% of all deaths. [3] The World Bank estimates 21% of communicable diseases in India are water related. Diarrhea alone killed over 700,000 Indians in 1999 (estimated) – over 1,600 deaths each day. The highest mortality from diarrhea is in children under the age of five, highlighting an urgent need for focused interventions to prevent diarrhea disease in this age group. [4]

Thus the present study was taken up to study:

1. The socio-cultural factors in relation to acute diarrhea.
2. Bacteriological quality of water in morbidity reported households in two geographical areas, within the limits of Bangalore city. The period of study was from September 2004 to October 2005.

METHODOLOGY

An area supplied exclusively by bore well water for drinking purpose and an area exclusively supplied by Bangalore water supply and sewage board (BWSSB) for drinking purposes situated within the limits of Bangalore city were selected. The areas supplied by the BWSSB received chlorinated water.

SAMPLE SIZE

On an average an Indian child suffers 6 episodes of diarrhea per year with a standard deviation of 2 episodes, [5] and based on 5% significant level and 0.5 episodes of error. Using the above data the sample size required for the study came to 65 children in each area. Children less than 5 years old constitute 12% of total population. [6] Hence 541 populations (approximated to 550) have to be surveyed. Assuming each household consists of 4 persons 150 houses have to be surveyed in each area. Area maps of both the areas were prepared. All the houses in each lane were enlisted in both areas. By modified cluster sampling a total 4 clusters consisting of 40 houses each in BWSSB water supply area and 6 clusters comprising 25 houses each were identified for

survey.

All members who were permanent residents of the identified houses were included after obtaining their consent. Households not willing to participate in the study were excluded.

Baseline information like number of family members, socio economic status, and information on drinking water supply such as the tap is exclusive to the household, frequency of water supply, storage practices and personal hygiene was collected from the responsible person of all selected houses by pre-structured and pre tested questionnaire using personal interviews. An observational checklist regarding handling of drinking water, environmental factors, latrine facility and sanitation of kitchen in relation to water safety were observed.

Weekly phone calls were made to all the selected houses. Enquiry for acute diarrhea as per WHO recommended surveillance definitions was made. The households with suspected morbidity were personally investigated using a pre tested case investigation proforma where information like history of fever, loose stool, abdominal pain, vomiting and its duration, history of travel and attending fairs and festivals, treatment history were taken. Water samples were also collected from the household storage points from where morbidity was reported on the same day.

Water samples were transported within two hours to the laboratory, analysed for chlorine concentration (not done for bore well water) and tested for coli forms by the membrane filter technique by incubating the processed membrane filter at 37 degree centigrade for 24 hours. Appearance of red colonies with a metallic sheen within 24 hours was considered as coliform groups and labeled non potable. Data was analyzed using Epi info statistical software .Descriptive statistics were obtained and relevant tests of significance were applied (chi-square).

RESULTS

The majority of the study population were in the age group of 21-40 years.(Table 1) 67.4% of persons were in the upper class followed by 31.1% in upper middle class and 1.6% in the lower middle class in the areas supplied by bore well. In the BWSSB water supply area majority 59.3% of the population were in lower middle class followed by upper lower class 22.6% and upper middle class 18.1%. (according to modified Kuppuswamy classification). [7] The difference in the socioeconomic status of the population in the study areas was statistically significant($p<0.001$). It has been observed from the present study that certain hygienic practices have bearing on the occurrence of the morbidities. In the present study some of these practices observed were found to be different in the two areas. This difference in the practices between the two areas was statistically significant ($p<0.05$) for washing vessel before collecting water, daily washing of vessel, covering of the vessel during transportation of water, duration of storage of water, hygienic way of drawing water, pretreatment of drinking water at household level.(Table 2) In the observation made by the investigator the differences in presence of an exclusive latrine facility for the house, hygienic way of handling drinking water in the two areas were found to be statistically significant ($p<0.05$) (Table 3) The study revealed that the incidence of diarrhea was 3.2% (3.1% in bore well and 3.2% in BWSSB areas) (Table 4). With most of the cases occurring in the month of November (Figure 1).

Of reported diarrheal cases 7.7% gave a history of attending fairs/ festivals/ functions. The study revealed that the practices such as washing vessel before collecting water, daily washing of vessel, covering of the vessel during transportation of water, duration of storage of water, hygienic way of drawing water and pretreatment of drinking water among the individuals with morbidities in the two areas were considerably different. ($p<0.05$). (Table 5)

A total of 46 water samples analyzed from the morbidity reported household storage points, 18 were from bore well areas and 28 were from BWSSB areas. Out of which 8 water samples were non potable in bore well water and 5 were non potable in the piped water areas.

Figure 1

Table 1 Age, sex distribution of study population in the study area

Age group(years)	Area				
	Bore well n=579		BWSSB n=875		p value
	Male	Female	Male	Female	
<5	18(6.3)	18(6.2)	44(9.9)	39(9.0)	0.026
6-20	49(17.1)	42(14.4)	145(32.7)	146(33.8)	<0.001
21-40	87(30.3)	90(30.8)	161(36.3))	176(40.7)	0.002
41-60	77(26.8)	100(34.2)	77(17.4)	59(13.7)	<0.001
>60	56(19.5)	42(14.4)	16(3.6)	12(2.8)	<0.001
Total	287(49.6%)	292(50.4%)	443(50.6%)	432(49.4%)	

(Figures in parenthesis indicate percentages)

Figure 2

Table2: Practices of the study population with respect to study areas

Practices	Bore well		BWSSB		p
	Yes	No	Yes		
Washing vessel before collecting water	579 (100)	0	862(98.5)	13(1.5)	<0.05
Daily washing of vessel	267 (46.1)	312(53.9)	669(76.5)	206(23.5)	<0.05
Covering of the vessel during transportation of water	338(58.4)	241(41.6)	803(91.8)	72(8.2)	<0.05
Water stored in the same vessel after collection	282(48.7)	297(51.3)	490(56.0)	385(44.0)	<0.05
Duration of storage of water	<1 day 338(58.4)	>1day 241(41.6)	<1day 732 (83.7)	>1day 143 (16.3)	<0.05
Covering of the vessel during storage of water	575 (99.3)	4(0.7)	864(98.7)	11(1.3)	>0.05
Method of drawing of water (hygienic)	404(69.8)	175(30.2)	235(26.9)	640(73.1)	<0.05
Pretreatment of drinking water	500(86.4)	79(13.6)	245(28.0)	630(72.0)	< .05

(Figures in parenthesis indicate percentages)

Figure 3

Table 3: Checklist of the variables related to practices observed in the study areas by the investigator

Variables	Bore well		BWSSB		p
	Yes	No	Yes	No	
Exclusive latrine facility for the house	575(99.3)	4(0.7)	299(34.2)	576(65.8)	<0.05
Washing hands before food	579(100)	0(0)	873(99.8)	2(0.2)	>0.05
Nail trimmed	575(99.3)	4(0.7)	873(99.8)	2(0.2)	>0.05
Vessel for stored water (clean)	579(100)	0(0)	854(97.6)	21(2.4)	>0.05
Handling of drinking water (hygienic)	285(57.8)	294(30.6)	208(23.8)	667(76.2)	< 0.05

Figure 4

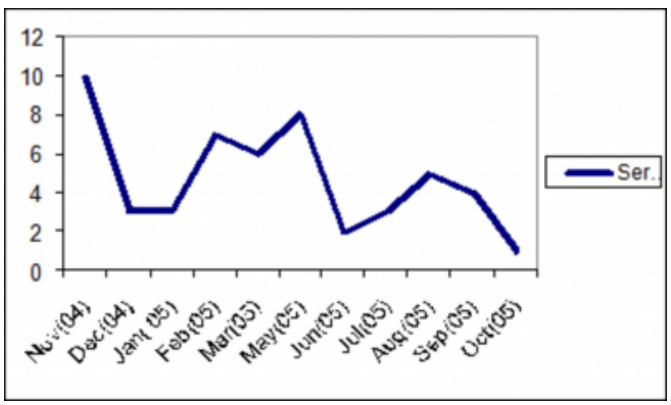
Table 4: Incidence rate of Diarrheal diseases and the source of water supply

Source	Diarrheal diseases		Total
	Present	Absent	
Bore well	18 (3.1)	561 (96.9)	579
BWSSB	28 (3.2)	847 (96.8)	875
Total	**46 (3.2)**	**1408 (96.8)**	**1454**

(Figures in parenthesis indicate percentages)

Figure 5

Fig: 1 Seasonal trend of diarrheal disease under surveillance



The line graph (fig 1) shows the occurrence of two peaks one was in November 2004 and the other in May 2005.

Figure 6

Table 5: Practices of the study population in those with diarrhea

Practices	Bore well		BWSSB		p
	Yes	No	Yes	No	
Washing hands before collecting water	18 (100)	0	28(100)	0	>0.05
Washing vessel before collecting water	18 (100)	0	26(92.9)	2(7.1)	< 0.05
Daily washing of vessel	5 (27.8)	13(72.2)	20(71.4)	8(28.6)	<0.05
Covering of the vessel during transportation of water	8(44.4)	10(56.6)	5(17.9)	23(82.1)	< 0.05
Water stored in the same vessel after collection	8(44.4)	10(56.6)	16(57.1)	12(42.9)	> 0.05
Duration of storage of water	9(50.0)	9(50.0)	24(85.7)	4(14.3)	< 0.05
Covering of the vessel during storage of water	18 (100)	0	27(96.4)	1(3.6)	> 0.05
Method of drawing of water (hygienic)	6(33.3)	12(66.7)	9(32.1)	19(67.9)	< 0.05
Pretreatment of drinking water	18 (100)	0	10(35.7)	18(64.3)	< 0.05

(Figures in parenthesis indicate percentages)

DISCUSSION

This study revealed an incidence rate of diarrheal diseases of 3.2% in area supplied by bore well water and 3.1%, in BWSSB areas. However the difference was not statistically significant. It was observed that in BWSSB area the distribution of population in the age group less than 20 years (42.74%) and also the incidence rate of diarrhea in the same age group was 78.57% which was more compared to bore well area where the population was 21.93% and the incidence of diarrhea was 50%. In bore well area the population above 60years (16.92%) and the incidence of diarrhea was 16.67% which is more compared to BWSSB area where the population was 3.2% and the incidence was 3.57%. Majority of people who attended fairs and festivals were from bore well supply area. Thus all these factors have resulted in similar incidence rate of diarrhea in both areas. It was also noted that in children less than 5 years the incidence of diarrhea was 38.89% and 57.14% in bore well and piped water supply areas respectively. The incidence rate of diarrhea in less than 5 years in BWSSB area was more because of poor feeding practices.. Lal P et al., [8] also observed an incidence rate of 2.91% for diarrheal diseases. Jagvir Singh et al. in their study observed that among children below five years of age an incidence rate of diarrhea of 2.27 episodes per child per year. [9]

There were two peaks of occurrence of diarrheal disease one was in November 2004 and the other in May 2005.However other studies by Pinfold Jet al [10] observed peak incidence of diarrhea in April –June. Mandal A.K, et al [11] observed in their study that diarrheal incidence was greater in spring and

summer months. Pokhre B.M et al [12] in their study in Nepal showed maximum number of cases occurred in the rainy season(June to August).

From our study it was inferred that the practices such as washing vessel, hygienic way of transportation, storage and drawing of water, and pretreatment of drinking water among the individuals with morbidities in the two areas were considerably different. The study revealed that 33% of those with diarrhea practiced hygienic method of drawing water however Vanderslice et al. [13] in their study reported 50% practiced hygienic method of drawing water.

CONCLUSION

Apart from contaminated water, there are other factors which play a role in transmission of water borne diseases like immunity, sanitation, socio-cultural, feeding practices and hygienic practices. Thus it is difficult to identify the specific routes that lead to diarrheal diseases. Post source contamination of water does affect health. Thus it is recommended that a greater emphasis on improving water quality at point of use is warranted by promoting better water handling during collection, storage and treatment by targeted, need based, focused interventions in terms of well designed educational capsule to address important socio-cultural practices. Thus an overall approach to community water, sanitation, hygiene and water source improvements can definitely produce better health outcomes.

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