



Microbial Water Quality Examination By H₂S Strip in Mysore City and Training Women for Decrease of Water Pollution

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ABSTRACT

Water samples were collected from eight different areas in Mysore city for the examination of microbial quality of drinking water by the H₂S strip test. It indicated that the percentage of water pollution rose in the selected areas in 2008, in addition the percentage of Cauvery water pollution, which is a major source of drinking water, increased in 2008. All the water samples, which were collected from storage sources of water in selected areas, were found to be polluted. As women have a vital role to play in the collection of water, women's practices and their behaviour is important for storing water and the steps taken to treat potable water. Another useful purpose for measuring the microbial quality of water is educational. Teaching people about the microbial quality of water and the fundamentals of the germ theory within the context of education and outreach programs for water, sanitation and hygiene at the individual, household, community and regional levels is a continuing and long-term goal in the global health initiative. In delivering these educational messages the H₂S-producing bacterial test is very suitable, as it is easier to use and is cheaper than the conventional procedures.

INTRODUCTION

Unfortunately waterborne diseases are most common in developing countries. For instance, in India alone, there are more than a million child deaths every year caused by waterborne diseases. As a result, a large section of the Indian population continues to be exposed to the ills of waterborne diseases. It is estimated that nearly 95% of the public water supplies with groundwater as the main source are bacteriological contaminated. Lack of awareness amongst the users has further compounded the problem (Kulkarni 2005).

Access to freshwater resources influences women's lives directly. It has an immediate impact on children's health (infant mortality rate show the links existing between women and water), and on that of the family, in general. According to the World Health Organization, approximately 250 million individuals were diagnosed with a water-borne diseases at the dawn of the twenty-first century. Of the 250 million, 75% of these individuals lived in tropical rural or slum-like areas (UNICEF/WHO 2000).

Lack of access to laboratories or field analysis kits is an obstacle to the provision of microbiologically safe drinking water to many communities and people worldwide. In an effort to overcome this problem, a number of alternative indicators and tests to detect faecal contamination of drinking water have been proposed and developed. Some of these proposed faecal indicators and their tests are simple, low cost and do not require a microbiology laboratory or bacteriological field test kit. Some of these simple, low cost faecal indicator tests have come into use in actual drinking water supply

practice. Prominent among these is the so-called hydrogen sulfide or H₂S test (Manja et al. 1982), which is intended to detect or quantify hydrogen sulfide-producing bacteria, considered to be associated with faecal contamination (WHO 2002).

There is a need for simple, reliable operator method based microbiological tests such as H₂S strip tests. Other simple and affordable tests have great value and even greater potential. Simple purification techniques and implementation of drinking water supply management and health education in the water and sanitation sectors is immediately required (WHO 2002). The test was originally developed to detect the production of H₂S in a volume of water by enteric bacteria associated with faecal contamination by the formation of a black precipitate from the reaction of the H₂S with iron in the medium. This relatively simple, low cost test has been studied, modified in various ways, tested and used to some extent in many parts of the world as an indicator of faecal contamination of drinking water.

This study indicated that percentage of pollution has increased from 66% in 2007 to 75% in 2008, and all water samples collected from storage sources were polluted in Mysore city. It also showed that the use of buckets and storage vessels is a major means of introducing contamination. Due to the daily water requirement, women have to store water and for this they use some vessels to collect drinking water. Usage of the fresh water and daily refilling of the vessel kept for drinking water can help the health of the householders.

MATERIALS AND METHODS

This study examined the microbiological quality of water by the H₂S strip test. H₂S strip test was selected, based on Manja et al. (1982) which is a simple and advantageous method of identifying microbial contamination of drinking water and is very useful in the area of health education. Samples of water were collected for microbial test of water quality from eight different areas in Mysore city and tested by H₂S strip test to identify their microbial contamination. The areas were selected based on the division of Mysore City Corporation (MCC). In order to emulate a fast responding and administrative system, which connect more effectively with the people needs, Mysore was divided into three divisions by MCC. The divisions are further divided into nine zones to include sixty five wards. In each zone a slum area and clean area was selected for the study as given below:

Name of Clean Areas	Name of Slum Areas
A. Naidu Nagara (zone 8)	a. Kesare (Slum Colony) (zone 8)
B. Krishnarajavana (zone 2)	b. Dr.B.R Ambedkar (Colony) (zone 2)
C. Gayatriपुरa (zone 9)	c. Jyothinagara P.K. (Colony) (zone 9)
D. Bogadi 2 nd Stage (zone 3)	d. Vasantha Nagara (Colony) (zone 3)

RESULTS

Results of the study are given in Tables 1, 2, 3 and Fig. 3. Table 1 indicates source of drinking water in eight areas selected for study in Mysore city. The people who stay in clean areas except Naidu Nagara use less amount of bore well water than those living in slum areas. In Jyothinagara P.K. (Colony), bore well water was pumped to the storage tank and distributed to the people.

Table 2 indicates results of 3 test (1, 2, and 3) in selected areas. All the water samples were collected in areas Naidu Nagara and Jyothinagara P.K. in 2007 and 2008 were polluted. Except for all water samples in areas Krishnarajavana area and Bogadi 2nd Stage area in Dec. 2007 and water sam-

Table 1: Sources of drinking water in selected areas.

Area	Name of areas	Source of drinking water		
		Public water supply (tap)	Bore well	Storage tank
A	Naidu Nagara	+	+	-
B	Krishnarajavana	+	-	-
C	Gayatri pura	+	-	-
D	Bogadi 2 nd Stage	+	-	-
a	Kesare(Colony)	+	+	-
b	Dr.B.R Ambedkar (Colony)	+	+	-
c	Jyothinagara P.K. (Colony)	-	+	+
d	Vasantha Nagara (Colony)	+	+	-

Source: Field Survey

Table 2: Results of three microbial water quality tests in selected areas in Mysore city by H₂S strip test (from June 2007 to June 2008).

S.No.	Name of area	Test 1 (Jun 2007)		Test 2 (Dec 2007)		Sl.No	Test 3 (Jun 2008)		
		No. Samples	No. Positives	No. Samples	No. Positives		No. Samples	No. Positives	
A	Naidu Nagara	5	5	5	5	A	5	5	
B	Krishnarajavana	5	5	5	0	B	5	5	
C	Gayatri pura	5	0	5	5	C	5	5	
D	Bogadi 2 nd Stage	5	2	5	0	D	5	5	
a	Kesre(Slum Colony)	5	3	5	3	a	5	3	
b	Dr.B.R Amberdkar (Colony)	5	2	5	5	b	5	5	
c	Jyothinagara P.K. (Colony)	5	5	5	5	c	5	5	
d	Vasantha Nagara (Colony)	5	5	5	3	d	5	3	
	Total	40	27	40	26	Total	40	36	
		Percentage of pollution 2007(66%)					Percentage of pollution up to Sep. 2008 (75%)		

Source: Field Survey

Table 3: Percentage of drinking water source pollution in selected areas in Mysore city.

Source	Test 1 (June 2007)			Test 2 (Dec 2007)			Total % of pollution (2007)	Test 3 (Jun 2008)		
	No. Samples	Positives	% of pollution	No. Samples	Positives	% of pollution		No. Samples	Positives	% of pollution up to Sep. (2008)
Tap (Cauvery water)	27	16	60%	27	17	63%	62%	27	27	100%
Bore well	10	8	80%	10	6	60%	70%	10	6	60%
Tank	3	3	100%	3	3	100%	100%	3	3	100%

Source: Field Survey

ples in Gayatri pura area in June 2007, which were not polluted, in the other areas all or some water samples were polluted. The percentage of pollution has increased from 66% in 2007 to 75% in 2008.

Table 3 shows the percentage of pollution from the source of drinking water in 8 different areas in Mysore city. It indicates that bore well water as well as Cauvery water supplied in Mysore city is polluted by pathogenic bacteria, and percentage pollution of Cauvery water (tap water) in 2008 is higher compared to 2007. But the percentage of the bore well pollution in 2008 is slightly (4.8%) lower than in 2007. The data also reveal that water in the entire storage tank is polluted.

Pollution through collection and storage of water: There is a common mistake about drinking water pollution, especially among poor people who are living in slum areas in developing countries. Researches show that those people think the drinking water pollution is always related to source of water, and they do not know about microbial pollution of water through collection and storage .

DISCUSSION

Women have long been in focus in the domestic water subsector, their central place based primarily on the idea of their natural role as household managers. For many years women have been identified as the main drawers of water (Thompson 2001). Because women play a major role in domestic water management in areas where safe water and drainage are not available in the house, in particular in these settings, women are typically responsible for collecting, storing and using water, and for disposing of wastewater (Poark 1984).

Studies also indicate that all water samples collected from storage sources were polluted and also showed that the use of buckets and storage vessels is a major means of introducing contamination. It is estimated that the majority of patients who were suffering from waterborne diseases, especially poor people, use stored water from polluted storage systems such as cloth covered taps, contaminated utensils, tanks or tumblers, which are used for drinking purposes (Figs. 1 and 2). So it is necessary to increase both knowledge and awareness among the people, especially women, about water pollution. The availability of simple, practical, accessible and affordable tests for faecal contamination of drinking water is extremely useful and a potentially powerful tool. In some situations the best tests to accomplish these goals are those that are the simplest to use, understand, visualize and interpret. This is because such tests can be widely disseminated both directly by the primary educators and then subsequently via communication within households, families, schools and communities and also by other means such as educational materials like leaflets, signs and labels. In addition to these listed purposes and needs, measuring the microbial quality of water for the presence of faecal contamination can be and is now being done for other beneficial purposes.

CONCLUSION

The study indicated that percentage of pollution has increased to 75% in 2008 and all water samples collected from storage sources were polluted in Mysore city. Therefore, the knowledge and awareness of women about waterborne diseases and microbial water quality should be increased through education. It is in addition a good opportunity to increase their knowledge by the demonstration of a simple method such as purification of polluted water and H₂S test through assistance of the local non-governmental organizations (NGOs).

NGOs are able to conduct on a regular basis training programmes, especially for the women who are living in epidemic waterborne diseases areas, on the topic of purification of drinking water, waterborne diseases and a test of microbial quality of drinking water by the H₂S strip test, and to



Fig. 1: Using unhygienic plastic tubes for collection of water in (d) Vasantha Nagara (Colony) area, Mysore city.



Fig. 2: Using unhygienic tubes with algal growth in (d) Vasantha Nagara (Colony) area, Mysore city,

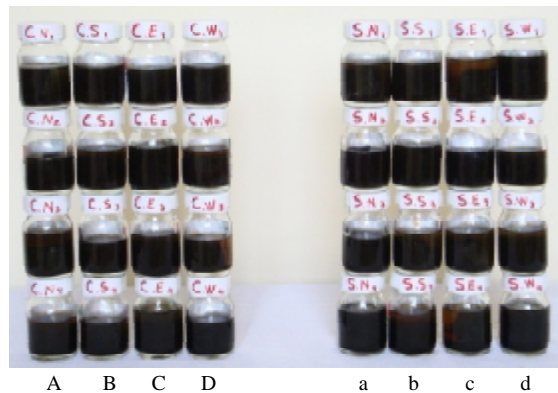


Fig. 3: Results of four tests of sample water collected from storage vessels in selected areas in Mysore city by H₂S method in June 2008.

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|--|--------------------------------------|
| A. Naidu Nagara | a. Kesre(Slum Colony) |
| B. Krishnarajavana | b. Dr.B.R Amberdkar (Colony) |
| C. Gayatripura | c. Jyothinagara P.K. (Colony) |
| D. Bogadi 2 nd Stage | d. Vasantha Nagara (Colony) |

Not polluted
 polluted

change their behaviour in the matter of providing potable water and water collected hygienically.

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