



Drinking Water: Assessment of Services and Practices in Surat City

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ABSTRACT

Introduction: Water is one of the basic needs of human life. Water borne diseases and water related chemical hazards are potential threats if water quality is not assured. The present study was conducted to record the drinking water related services, practices and report the chemical quality parameters

Methodology: A cross sectional study was carried out in all the 7 zones of Surat city. House-to-house survey was done by using a pre designed semi-structured questionnaire. Interviews of 140 households and testing (Chemical-analysis) of 14 samples of drinking water were carried out.

Results: Main source (92.1%) of drinking water was piped water. A total of 86.4% households felt the supply as adequate; bad appearance reported by 1.4%. Prompt action was taken by SMC in 60% complaints. Filtration was practiced by 47.9%. Among the 14 samples collected for chemical analysis, 7 drinking water samples were declared unfit for drinking purpose by Public Health Laboratory, Surat due to presence of Nitrite and Ammonia.

Conclusions: All the households had access to the drinking water, however, 50% of the sampled water was deemed unfit. Stringent water quality checks need to be started to ensure quality. Community awareness needs to be emphasized.

Key words: Drinking Water, Services, Practices, Chemical Analysis

INTRODUCTION

Water is one of the most basic needs of human life. Safe and wholesome water is recommended for drinking water. Urban growth, increased industrial activities, intensive farming and overuse of fertilizers has affected quality and quantity of ground water. ¹⁻⁴ There is a persistent threat of water borne diseases and water related chemical hazard if water quality is not assured. It is the responsibility of the government to provide safe drinking water to its citizens. Community practices related with drinking water also affects health as many diseases are transmitted through water. ⁵⁻⁷

Water Supply System of Surat City is 100% based on surface water of river Tapti. Surat Municipal Corporation (SMC) is among a very few local bodies in the country which has already acquired

ISO:9001:2008 certification for implementing Quality Management System (QMS) at all water works. As a part of Water Quality Monitoring System, consumer water samples are collected by Surat Municipal Corporation and analyzed in dedicated laboratory. Details of zone wise status of unfit samples along with its location are published on SMC's website on monthly basis.⁸

A household survey can help researchers to understand the fate of water from the time it reaches the home to the point of consumption. It is also emphasized in Sustainable Developmental Goals.⁹ It can provide valuable information about the quality and reliability of water reaching the home and changes to water quality through household storage and treatment. It can also provide information on the prevalence of water-related illnesses, community percep-

tions and concerns, alternate or supplemental water sources, and customer satisfaction other information.¹⁰ This study was planned to study the end point quality of water consumed at the household.

The study was conducted to explore the situation of drinking water related services, chemical quality parameters at the endpoint and record practices related to drinking water in Surat city

METHODOLOGY

A cross sectional observational study was carried out in Surat city. It is divided into 7 different zones for administrative purpose and the population belongs to different socio economical classes. There is a huge range which has people living below the poverty line to the super rich class. To address this divide, one slum or AWAS type (representative of lower socio economic strata) and one apartment, bungalow or row house type residency (representative of upper socio economic strata), was selected randomly from each zone.

At each selected place, 1st house was selected randomly by lottery method and then consecutive 10 households were selected for interviews. Out of the 10 households interviewed, 1 household was selected randomly to collect water sample - about 1 liter - for chemical analysis at Public Health Laboratory, Surat. Thus total 140 purposively selected households were interviewed and 14 samples were collected and sent for testing the chemical parameters. Closed households were excluded from the study and the immediate next household was interviewed. No refusal was encountered. Verbal consent was taken for participating in the study. Data entry and Analysis was done using Microsoft Excel 2007 and SPSS version 16.

Tool used to conduct interviews of households to assess services - preformed questionnaire prepared by Public Affairs Committee [PAC] was used⁵; and to assess practices - semi structured pre tested questionnaire was used. Questionnaires were filled by researchers after explaining properly and fully to study participants in the language they understand.

RESULTS

Demographics: Study was conducted in Surat Municipal Corporation area. Among studied population 77 (55%) families were of Joint / Extended type and 63 (45%) were of Nuclear type. Socio Economical classification was done according to Modified Prasad’s method (AIPCI was 1167 for July 2014) (Table: 1). In the study population, 91.4% of the people who were handling water for their households were literate.

Main source of water supply and services: Main source of water supply among studied population was piped water supply for 129 (92.1%) household and public tap for 10 (7.8%), while 1 (0.1%) purchased drinking water. (Graph:1)

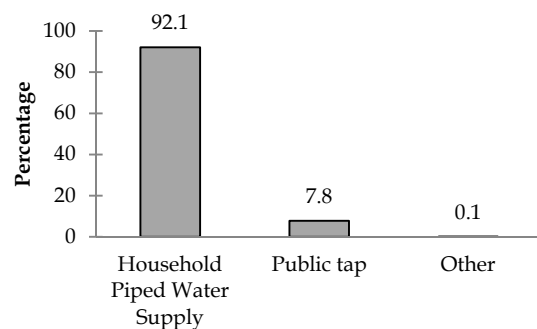
Surat Municipal Corporation supplies drinking water once a day. Among the study participants, 60.7 % perceived that once a day water supply is enough for drinking purpose; rest (39.3) replied that drinking water should be supplied more than once a day.

Methods of Drinking water purification: The most common method used for drinking water purification was filtration (47.9%), followed by RO system (20.7%), filtration + boiling (13.6%) and boiling. It was notable that 12% of households did not use any purification method. (Table:2)

Table 1: Type of family and Socio Economic classification of study population

Characteristics	Participants (n=140) (%)
Type of Family (n=140)	
Nuclear	63 (45)
Joint / Extended	77 (55)
Socio Economic Classification*	
Class 1	38 (27.1)
Class 2	30 (21.4)
Class 3	16 (11.4)
Class 4	34 (24.3)
Class 5	22 (15.7)

*Modified Prasad’s method



Graph 1: Main Source of Drinking water supply in studied area

Table 2: Methods of Drinking water purification used by study participants

Method Used for House Level Filtration	Participants (n=140) (%)
No method	17 (12.1)
Filtration	67 (47.9)
Filtration +Boiling	19 (13.6)
Boiling	8 (5.7)
RO System	29 (20.7)

Table 3: Zone wise results of chemical testing of drinking water

Zone	Area	Fit/Unfit	Reason For Unfit
South	Slum	Unfit	Pollution, Nitrites
South	Residency	Unfit	Pollution, Nitrites
South East	Slum	Fit	Not Applicable
South East	Residency	Fit	Not Applicable
East	Slum	Fit	Not Applicable
East	Residency	Fit	Not Applicable
North	Slum	Unfit	Pollution, Nitrites
North	Residency	Unfit	Nitrites
South West	Slum	Unfit	Pollution
South West	Residency	Unfit	pH
West	Slum	Fit	Not Applicable
West	Residency	Fit	Not Applicable
Central	Slum	Fit	Not Applicable
Central	Residency	Unfit	Pollution

Response of SMC to Complaint related to drinking water: From 140 studied households, 10 (7.2%) had registered complaints. Among the complaints registered for drinking water services, 60% respondents perceived that SMC took immediate actions. Actions taken in the rest of the complaints was delayed.

Satisfaction with services related to Drinking Water: Among the studied households, 95.7% were satisfied with drinking water related services provided by SMC and 4.3% were unsatisfied. Among satisfied households, 93% were completely satisfied and 7% were partially satisfied.

Adequacy of drinking water supply: When responders were asked whether quantity of water that is supplied for drinking purpose was adequate for their needs, 86.4% of respondents replied that supplied quantity is adequate for their needs. Among study participants, 96.4 % replied that drinking water is available throughout the year, rest reported of scarcity during summer months.

Quality of supplied water: Bad appearance of supplied water was reported by 1.4% of participants, remaining did not have any complaints about quality of drinking water. When participants were asked whether supplied water is perceived safe for drinking purpose or not, majority (95.7 %) said that it was safe; few (2.4%) perceived it as unsafe and rest (1.5%) were unsure about safety.

Practices related to drinking water: A small (13%) proportion of households used tanks for drinking water storage; rest used earthen and metal pots. All those who used tanks replied that they cleaned storage tanks within past three months. Majority (87%) reported use of ladle for taking out water from pots.

Result of Chemical parameter testing of drinking water: Total 14 samples were given for chemical parameter testing at Public Health Laboratory, Su-

rat. As shown in Table 3; 50% of all water samples were reported to be unfit for drinking purposes. Reason for unfitness of drinking water was presence of pollution and nitrites in 3 samples, pollution in 2 samples, nitrite in 1 sample and abnormal pH (normal pH 6.5-8.5) in 1 sample. (See Table:3)

DISCUSSION

Source of drinking water: Main source of water supply among studied population was piped water supply for 129 (92.1%) household and Public tap for 10 (7.8%), while 1 (0.1%) used to purchase drinking water. In a CDC study conducted in Linden at Guyana, seventy nine percent of respondents (419) received water from GWI directly to a tap inside their home, and another 14% (74) used water from a tap in their yard or a shared stand-pipe as their primary source. Twenty-three percent (125) of respondents of that study regularly collected water from a river, creek or spring; 20% (108) regularly purchased bottled water; 13% (70) purchased water from a refilling station (where tap water is sold by a private company after it is reportedly re-treated); and 41% (222) regularly collected rain water in addition to other sources of water.¹¹ In a study conducted by A. A. PARKER et al, source of drinking water was found to be 61% piped water, rain 7%, river 9%, borehole 8%, dam 4%, lake 4%, other 6% in 2004.¹² Thus large number of households with piped water supply shows better coverage of services by Municipal Corporation. Different periodicity and study areas might be possible reasons behind the differences in the results obtained.

Storage of water: In this study 13% responded positively about use of tanks for storage of drinking water. In a CDC study conducted in Linden at Guyana, one hundred fifty-eight households (30%) had a water storage tank.¹¹ Lesser storage practice in this study might be attributed to regular and adequate drinking water supply.

Quality of water: When 1.4% of participants reported bad appearance of supplied water at times, remaining did not have any complaints about quality of drinking water in this study.

In a study conducted by Jessica C. Wedgworth et al, offending water taste, colour and/or odour were reported by approximately 20% of all participants, with objectionable tastes being reported with the highest frequency of the three (21.2%).¹³ This shows that majority of the population is satisfied with the services provided by municipal corporation as corporation has got ISO certified water treatment plants and tries to ensure better quality of supplied drinking water.

Adequacy of drinking water supply: When responders were asked whether quantity of water that is supplied for drinking purpose was adequate for their needs, 86.4% of respondents replied that supplied quantity is adequate for their needs. In a study done by Palestinian Hydrology Group, 64% perceived supplied water quantity as adequate for their needs.¹⁴ More satisfaction related with adequacy of drinking water in this study shows efficient allocation of available resources. Availability of resources might be different in different geographical areas.

Household level water disinfection practices: The most common method used for drinking water purification was filtration (47.9%), followed by RO system (20.7%), filtration + boiling (13.6%) and boiling. It was notable that 12% of households did not use any purification method. In a CDC study conducted in Linden at Guyana, eighty seven percent of households used tap water for drinking; 35% reported drinking it directly (without treatment) and 52% said they treated it before drinking. Those who treated their drinking water at home (from tap or other sources) did so by adding chlorine or bleach (70%), boiling (49%), or using a filter, such as coal, sand or cloth (2%).¹¹ Difference in the water disinfection practices might be due to technological advancement as well as economical development.

Perceived health concerns with drinking water: When participants were asked whether supplied water is perceived safe for drinking purpose or not, majority (95.7 %) said that it was safe: few (2.4%) perceived it as unsafe and rest (1.5%) were unsure about safety. In a study conducted by Diane Dupont et al, 57.1% responded health related concerns because of supplied drinking water and bottled water was perceived safer than piped water by 75.8% which was different that the findings of the current study.¹⁵

Reports of chemical analysis of the drinking water samples suggests necessity of improvement in the services related to piped water supply as an intermittent water supply might also contribute to ill effects on the health. This is similar to findings from various studies conducted by different researchers.¹⁶⁻¹⁹ Role of community awareness related to drinking water safety is also need to be reinforced.

LIMITATIONS

Though coverage area is wide, sampling technique used in this study is non probability sampling. Sample size is also small. Chemical parameter testing was done for 14 samples from total 140 households.

CONCLUSION

All the households in this study had access to the drinking water supplied by the municipal corporation. Bad quality of water was perceived by only 1.4% households, however, 50% of the sampled water was deemed unfit. Stringent water quality checks need to be started to ensure quality. Regular sanitary survey and strict surveillance is necessary. Community awareness regarding potable water needs to be emphasized.

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