Research Article

Drinking water quality, sanitation and hygiene practices in a rural community of Sokoto State, Nigeria

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ABSTRACT

Background: In many developing countries, Nigeria inclusive, water quality and the risk of waterborne diseases are critical public health concerns. Safe drinking water, sanitation and hygiene are among the five key strategies aimed at combating neglected tropical diseases. **Objective:** The objective of the study was to assess drinking water quality, household sanitation, and hygiene practices in a rural community. **Materials and Methods:** A descriptive cross-sectional study was carried out at Tunga Magaji, a rural community of Wamakko local government area, which is one of the Metropolitan Local Government Area of Sokoto state. A total of 391 households participated and were selected using a multistage sampling technique. Household questionnaires and checklist were used to collect data, which were analyzed using IBM Statistical Package for the Social Sciences version 20.0. Results were presented in tables and chart. Univariate analysis in the form of mean and standard deviation was carried out on continuous data. The categorical and grouped data were summarized using frequencies and percentage. **Results:** River/stream is the major source of their drinking water followed by dung well. Almost all the respondents (97.0%) perceived the water source to be safe for drinking even though more than half said the water has taste. All water samples were weakly basic and had a specific gravity of one. A tap point, dung well and borehole source demonstrated a significant coliform organisms (*Escherichia coli*) growth. Only 58% of the households have toilet facilities while the remaining uses different unsanitary methods. More than half (59%) reported washing hand always after toilet use and after handling children's feces, although only 37% of them reported the use of soap and water. The most common health problem in the community was diarrheal diseases with a prevalence rate of 61%. **Conclusion:** Some drinking water source had significant coliform counts, and large proportion of households does not have sanitary facilities with the diarrheal disease being the major health problem.

KEY WORDS: Drinking Water Quality; Sanitation; Hygiene; Rural Community

INTRODUCTION

Drinking water regardless of the source and mode of supply either from a drinking water system, or a tanker, or taken from well is water intended for drinking, cooking, food preparation, or other domestic purposes.[1] Safe drinking water, sanitation and hygiene are among the five key strategies aimed at combating neglected tropical diseases.[2] In many developing countries, water quality and the risk of waterborne diseases are critical public health concerns. Today, close to a billion people most living in the developing world lack access to safe and adequate water.[3]

Great concern must be given to the quality of drinking water as it is very critical for the overall socioeconomic development of any society.[4] For water to be safe and acceptable for

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drinking, it must possess some basic physical, chemical, and biological properties based on the total coliform count which the maximum permitted levels are 10 cfu/mL.[1] Sanitation and hygiene practices help maintain and promote health while preventing the spread of diseases, through proper hand washing with soap or other agents, food hygiene, overall personal hygiene including laundry, and environmental cleaning.[5] Due to the global impact of sanitation every October 15 of each year is a recognized as hand washing day to motivate and mobilize people around the world to raise awareness and improve their hand washing habits with water and soap as a key approach to disease prevention and control.[6]

World Health Organization (WHO) estimated that around 94% of the global diarrheal burden and 10% of the total disease burden are due to unsafe drinking water, inadequate sanitation, and poor hygienic practices.[3] Water supply and sanitation monitoring program revealed that only 58% of Nigerian population has access to improved drinking water supply and sanitation coverage stood at only 32% leaving over 100 million people without access to improved sanitation.[4]

The caliciviruses and rotaviruses are among the major causes of diarrhea worldwide and a significant cause of mortality among children in developing countries are associated with unwholesome water sources.[7] Unsafe water, together with poor sanitation and hygiene, is the overwhelming contributor to illnesses and many deaths caused by diarrhea every year. Majority (90%) of this burden is borne by under-five children who are more vulnerable, and 94% of diarrheal cases are preventable through environmental modifications by interventions that increase the availability of clean water.[8] Unsanitary condition of the environment with open refuse dumps serving as hiding and breeding sites for rats which transmits various kinds of infections, which in the current setting of Lassa fever worsens its epidemic occurrence in the country.[9]

Nigeria is the most populous country in Africa and the 14th largest in land mass. The country's 2006 population and housing census placed the country's population at 140,431,790, with a national growth rate estimated at 3.2% per annum.[10] The multiple indicator cluster survey (2017) report showed that 63.4% of national population lives in rural areas.[11]

In the 2013 National Demography and Health Survey (NDHS), a household was defined as a person or group of persons, related or unrelated, who usually live together in the same dwelling unit, have common cooking and eating arrangements, and acknowledge one adult member as the head of the household. A member of the household is any person who usually lives in the household. Non-improved source such as unprotected well, unprotected spring, tanker truck/cart with drum, surface water, and sachet water was the predominant source of drinking water for rural households and 89.2% of the households do not treat the water before drinking. Moreover, the majority (61.5%) of the rural households uses non-improved facilities such as flush/pour flush not to sewer/septic tank/pit latrine, pit latrine without slab/open pit, bucket, hanging toilet/hanging latrine, and no facility/bush/field as sanitation facilities.[10] Lack of basic facilities for sanitation presents a major risk to public health. Hand washing is a simple and cost-effective intervention for the prevention of infectious diseases transmission. Therefore, hand washing with soap and water is ideal, but hand washing with a non-soap cleaning agent such as ash or sand is an improvement over not using any cleansing agent. In spite of these benefits only 15.6–13.4% of rural households do hand washing with soap and water, and water only, respectively.[10] These poor environmental sanitation and hygiene practices in the rural households predispose and makes the members vulnerable to environmentally associated ill health with resultant loss of productivity and significant impact to population health. It is within this background that the study was conducted to assess the quality of drinking water in terms of its physical and biological characteristics, sanitation and hygiene level of the community at the household level.

MATERIALS AND METHODS

The study was conducted in Tunga Magaji, a rural community in Wamakko local government area, which is one of the Metropolitan Local Government Area of Sokoto state. The study population comprised all the adult member of the household in the community; however, empty households at the time of data collection were excluded.

A descriptive cross-sectional study design was used. The required sample size was determined using formula for descriptive cross-sectional study design for population greater than 10,000,[12] $n = Z^2_{\alpha} \times pq/d^2$, where, n = minimum sample size desired for the study; Z_{α} = Standard normal deviate with corresponding Z value at α level of 0.05 = 1.96; P = Prevalence of factor under study as reported in the previous study (53.8%, percentage of protected dug wells located within 10 m of source of pollution).[13] A correction factor for an expected potential attrition, due to either poorly filled questionnaire or misplacement was added assuming response rate of 90%.[14] This translated to sample size of 420.

Sampling Method

Multistage sampling technique was used to select the study respondents from the households. In stage one; one ward out of 10 was selected for the study using a simple random sampling technique (paper rolling and picking method) while for stage two; all the households were selected using systematic sampling technique. All the houses in the community were number serially and constituted the sampling frame. The sampling interval was calculated by dividing the total number

of households (1262) by the sample size (420), which translated to approximately 3. Therefore, every third household was selected except in few cases where nobody was in the selected household, and the next was selected until the end of the process. In stage three, the first household was selected using a simple random sampling technique between 1 and 3.

Data Collection Methods

The instruments used were close-ended questionnaire, checklist, and data extraction. Interviews, as well as observations, were carried out. The questionnaire was structured into sections on respondents' sociodemographic characteristics, drinking water quality, sanitation and hygiene, and the health of households. The checklist comprises observations on the water sources and household sanitation and hygiene. The data extraction sheet was used to record the results of water sample analysis. Water sample collection: 10 water samples were randomly collected from the major water sources of the community for physical and bacteriological examination in sterile, labeled bottles taking care to prevent accidental contamination of the water during collection. Sample analysis (physical parameters): The color, PH, taste, and temperature of water samples were checked and recorded at the time of collection while specific gravity was done in the laboratory. Sample analysis (Bacteriological testing of water): The membrane filtration technique was used. The materials we used were filtration unit and suction devices, sterile membrane filter, filter base (grid-slide uppermost), and sterile blunt-ended forceps. The principle of the test was that water was suctioned through membrane manually and the filter paper was removed from the filtration unit and placed in a culture plate on the culture medium pad in a Petri dish, ensuring no air bubble trapped under the membrane. The procedure used filtration unit and suction devices were assembled and the sterile membrane filter placed on the filter base (grid-slide uppermost) using some sterile blunt-ended forceps. The water samples were mixed thoroughly and filtered through the membrane, 100 ml was collected for each sample of water source. The filter paper was removed from the filtration unit and placed on the culture medium pad in a Petri dish. The dish was labeled with a code number of the water sample and volume of the water used, and finally, the dishes were incubated at 37°C for 18 h. The membranes were examined, and the number of yellow lactose fermenting colonies counted and recorded. Calculation was done using the number of yellow lactose fermenting colonies that were counted and recorded. The calculation was done as follows: For 100 ml water sample, number of colonies multiplied by one and 50 ml water sample, number of colonies multiplied by two.[15]

Data Analysis

Data were entered into and analyzed using Statistical Package for the Social Sciences **version** 20.0 IBM Corporation. Continues data were summarized using mean and standard deviation while categorical data using frequencies, percentage, and proportion. Results were presented with simple tables for clarity.

Ethical Consideration

The ethical approval for the conduct of the study was sought and obtained from Sokoto State Health Research Ethics Committee. Permission for community entry was obtained from the district head while consent was obtained from respective household head before a questionnaire was administered to the household member and water sample collected.

RESULTS

Respondent's median age was 30 years. Nearly, all are Hausa-Fulani (99.7%) and a large proportion (95.7%) was females. Greater than two-third had only informal education while one-tenth had formal education with only 10 attaining tertiary education. About one-third was non-gainfully employed housewife, followed by those that engage in petting trading by 31% while government employee accounted for only 3%. More than two-third (70%) of household heads had only informal education and 15% had secondary education, while only 5% attain tertiary education. One-third of the respondents were farmers, followed by petty traders 29% while only 11% are civil servants [Table 1].

Household source of drinking water cuts across the primary and secondary sources. River is the major primary source of water for nearly three-quarters, while rainwater was reported main secondary source for nearly one-third of the households, respectively. Only 1% of the households had their water source located within the household, 52.6% had water fetched from the source outside the household by children and 46% by adults. Furthermore, all the households surveyed had to store their drinking water. Majority (75%) reported use of wide mouth container with cover for the storage followed by 23% that use a narrow neck container while 2% use a wide mouth container without a cover. Almost two-third 68.2% of the respondents said children have access to the stored drinking water. Large proportion 78.4% uses aluminum hydroxide followed by 8.4% that use sedimentation method (allow water to stand and settle) while 6.4% use straining method through a clean cloth. Nearly, all the respondents (97%) perceived their water source to be safe for drinking [Table 2].

Physical appearance of the water samples revealed turbidity from one of the public tap point and river source while well water and stored well source were slightly turbid. All the water sources were weakly basic and had specific gravity of one. Biological examination of different drinking water source showed that stored river water sample tested positive

Table 1: Sociodemographic characteristics of respondents

Variables	*n* (%)
Age group (years)	
<40	152 (70.1)
40 and above	107 (29.9)
Sex	
Male	17 (4.3)
Female	376 (95.7)
Marital status	
Married	365 (92.8)
Single never married	16 (4.1)
Single ever married	12 (3.1)
Tribe	
Hausa	388 (99)
Fulani	4 (1)
Respondents' educational status	
Informal	341 (87.9)
Primary	24 (6.2)
Secondary	13 (3.4)
Tertiary	10 (2.6)
Respondents' occupation	
Civil servant	13 (3.4)
Farmer	22 (5.7)
Petty trader	119 (30.7)
Artisan	106 (27.3)
Housewife	128 (32.9)
Educational status of household head	
Informal	274 (69.7)
Primary	41 (10.4)
Secondary	57 (14.5)
Tertiary	21 (5.3)
Occupation of head of households	
Civil servant	44 (11.2)
Farmer	133 (33.8)
Trader	114 (29.0)
Artisan	49 (12.5)
Other (driving, okada, selling water, etc.)	53 (13.5)

Table 2: Household sources and methods of handling of drinking water

Variables	Frequency (%)
Primary source of water	
Piped water	21 (5.3)
Borehole	7 (1.8)
Well	66 (1.8)
Public tap	18 (4.6)
River/stream	277 (70.5)
Water vendors	2 (0.5)
Sachet water	2 (0.5)
Rain water	0 (0)
Secondary source of water	
Piped water	46 (11.7)
Borehole	17 (4.3)
Well	56 (14.2)
Public tap	82 (20.9)
River/stream	38 (9.7)
Water vendors	4 (1.0)
Sachet water	31 (7.9)
Rainwater	119 (30.3)
Mode of storing drinking water at home	
Use of narrow neck container	90 (22.9)
Wide mouth container with cover	295 (75.1)
Wide mouth container without cover	8 (2.0)
Method use to obtain water from stored containers	
Permanent cup	155 (39.4)
Any cup	177 (45.0)
Pouring	61 (15.5)
Accessibility of stored drinking water to children	
Accessible	268 (68.2)
Not accessible	125 (31.8)
Treatment of drinking water at household level	
Yes	370 (94.1)
No	23 (5.9)
Methods used in treating drinking water at household level	
Boiling	4 (1.0)
Adding alum	308 (78.4)
Strain through a cloth	25 (6.4)
Let it stand and settle	33 (8.4)
Others	23 (5.9)

for *Staphylococcus aureus* while tap B point, well water and a borehole source demonstrated a significant growth of coliform organisms (*Escherichia coli*) [Table 3].

Change the whole paragraph as: "Three-quarter of the respondents reported hand washing after using toilet and 59% reported washing their hands always after handling children's feces respectively. While 17.3% and 16.5% wash their hands most times after toilet use and after handling children's feces respectively, while 0.3% don't wash hands at all after toilet use and after handling children's feces. Almost half (49.1%) reported using water only, and 37.2% use soap and water, while 13.7% use sand and water. More than three quarters of households reported having separate containers for fetching/storing water and for bathing while 12% do not have [Table 4].

<2–3rd (57.8%) of the households have toilet facility, out of which 67% were pit latrine with slab followed by use of bucket latrine by 29% while five households (2.2%) have water closet. Households without toilet facility accounted

Table 3: Physical and biological characteristics of household drinking water

Sources	Appearance	Temp.	PH	Specific gravity	Culture
Stored river water	Clear and colorless	34.9	8	1	*Staphylococcus aureus*
Stored tap water	Clear and colorless	35.4	8	1	Nil growth
Stored well water	Slightly turbid	35.6	8	1	Nil growth
Tap water A	Clear and colorless	35.3	8	1	Nil growth
Tap water B	Turbid	35.8	8	1	*E. coli* (significant count)
Well water	Slightly turbid	35.1	8	1	*E. coli* (significant count)
Borehole A	Clear and colorless	33.4	8	1	*E. coli* (significant count)
Borehole B	Clear and colorless	34.6	8	1	Nil growth
River point A	Turbid	35.5	8	1	Nil growth
River point B	Turbid	35.1	8	1	Nil growth

E. coli: Escherichia coli

for 42%, of which 94.6% defecate in nearby bush, 2% use neighborhood toilet while 4.8% defecate in the polythene bag to be disposed off into open field. The result also showed that almost one-third (32%) of household does not properly cover the cooked food and more than three-quarters (84.5%) do not have soap and water in toilet for hand washing. Solid waste and human feces were observed within and around the houses, respectively, in 83–21% of households while overflowing septic tank/soak away pit in and/or around the house were found in 61% of households surveyed [Table 5].

Almost one-third of households reported diarrheal diseases among children <5 years, followed by diarrhea and vomiting by 23.2% while malaria accounted for 15.5% of the cases. Among other members of households, almost half (49%) were accounted for by malaria followed by diarrhea only by 16% and then respiratory tract infection by 12.2%. The most prevalent health problem in the community in the past 6 months' period was diarrhea and or vomiting with a prevalence rate of 61%. As high as 38% of the respondents do not know the cause of diarrhea diseases as 3.8% attributed it to drinking bad water and 2% preparing food with bad water while 6.4% felt not washing hand before eating were the causes. Storing water in safe and clean containers, treating water for drinking at home before consumption, protecting water sources from contamination and improving household sanitation and personal hygiene practices were some of the preventive measures suggested by the respondents as ways of preventing the occurrence of diarrhea and vomiting [Table 6].

DISCUSSION

The descriptive cross-sectional study was conducted to assess drinking water quality, sanitation and hygiene practices in a rural community of Sokoto State. An interviewer-administered questionnaire method with multistage sampling technique was applied to collect the data from household members. The process of selecting the study respondents was done in stages: In stage 1: Selection of study community using a simple random sampling technique (paper rolling and picking method); stage 2: Selection of households using systematic sampling technique (sampling interval of 3 was obtained) and stage 3: Selection of the first household was selected using a simple random sampling technique between 1 and 3. Thereafter, every third household was selected except in few cases where nobody was in the selected household, and the next household was selected. The process continued until the required sample size of the respondents was obtained.

The drinking water source mapping showed that tap, borehole, dug well, river/stream, and rainwater were key source of domestic water in the community. Only a few of the households have their primary source of drinking water from improved sources such as piped water, borehole, and public tap. This is a typical characteristic of rural communities in this part of the country. This finding is in agreement with a study done in Kwara State where only 10% of households have access to similar facilities.[14] Findings from NDHS, 2013 also revealed that majority of rural households do not have access to improve the source of drinking water and nearly almost all the households do not treat the water before drinking.[10] The implication is endemicity and occurrence of water and foodborne disease outbreak with its associated mortality due to inherent poor emergency preparedness and response.

Very few households have their water source located within the compound while more than half had their water fetched from the sources outside the household by children. In this part of country, male household head carries out usually most of outdoor domestic works, as married women including grown-up female children are not allowed to freely work outside. Households, therefore, have to rely on source from children member of household and other sources such as cart water vendor, trucks that are all non-improved source liable to contamination. Findings of a study in Kwara State revealed that children carry out nearly all of the water fetching in the household.[16] Due to poor environmental sanitation and hygiene level in rural communities, the water source could be contaminated at source by human or animal,

Table 4: Household hygiene practice among the respondents

Variables	Frequency (%)
How often do you wash hands after using toilet	
Yes, always	297 (75.6)
Yes, most time	68 (17.3)
Yes, some time	27 (6.9)
Not at all	1 (0.3)
Washing hand after handling children's feces	
Yes, always	232 (59)
Yes, most time	65 (16.5)
Yes, some time	34 (8.7)
Not at all	1 (0.3)
Not applicable	61 (15.5)
What is used to wash hands	
Water only	193 (49.1)
Soap and water	146 (37.2)
Sand and water	54 (13.7)
How often do you wash hand before eating/cooking	
Yes, always	278 (70.7)
Yes, most time	75 (19.1)
Yes, some time	37 (9.4)
Not at all	3 (0.8)
How often do you wash children's hand before eating	
Yes, always	164 (41.7)
Yes, most time	95 (24.2)
Yes, some time	70 (17.8)
Not at all	3 (0.8)
What do you use to wash hand?	
Water only	295 (75.1)
Soap and water	88 (22.4)
Sand and water	10 (2.5)
Separate containers for bathing and storing drinking water?	
Yes	346 (88)
No	47 (12)
Rodents presence in the household	
Yes	347 (88.3)
No	46 (11.7)

Table 5: Sanitation practice at household level

Variables	Frequency (%)
Availability of toilet facility	
Available	227 (57.8
Not available	166 (42.2
Type of toilet facility available	
Pit latrine with slab	152 (67)
Water closet	5 (2.2)
Pit latrine without slab	4 (1.8)
Bucket latrine	66 (29.0)
Household without toilet facility defecate in the:	
Bush	155 (94.6)
Neighborhood toilet	3 (1.8)
Use polythene bag to be disposed off	8 (4.8)
Mode of disposing children's feces	
Child uses toilet	29 (7.3)
Put into latrine/water closet	107 (27.2)
Bury with sand	79 (20.0)
Left in open to dry out	116 (29.5)
Observed household sanitation and hygiene practices	
Proper covering of food	
Yes	268 (68.2)
No	125 (31.8)
Water storage container with cover	
Yes	347 (88.5)
No	45 (11.5)
Availability of soap and water in toilet for hand washing	
Yes	61 (15.5)
No	332 (84.5)
Solid waste in and around the house	
Yes	325 (82.7)
No	68 (17.3)
Human feces in and around the house	
Yes	83 (21.2)
No	309 (78.7)
Stagnant wastewater in and or around the house	
Yes	162 (41.2)
No	231 (58.8)
Overflowing septic tank/soak away pit in or around the house	
Yes	238 (60.6)
No	154 (39.4)

during transportation or at the household during the process of storage. Human beings and other animals are known to discharge large number of intestinal bacteria into stool and urine. Therefore, bacteria appear in drinking water when water source is contaminated with stool.

Assessment of physical parameter of the different sources showed that the temperature of the water samples was higher than the recommended value given by the WHO and Nigerian Standard for Drinking Water Quality values.[1] This is not surprising as the temperature is usually high during this period of the year in this part of the country and this influence the temperature of the water. However, temperature value is an indicator of water quality as it can influence the pH and dissolved oxygen in the water. High temperature might increase odor by impeding oxygen dissolution favoring anaerobic reactions, therefore, making the water

Table 6: Common health problems of under-five and other members of households

Variables	Frequency (%)
Health problems of under-five children	
Diarrhea only	127 (32.3)
Diarrhea and vomiting	91 (23.2)
Malaria	61 (15.5)
Abdominal pain with passage of mucus in blood	16 (4.1
Respiratory infection	28 (7.1)
Others	9 (2.3)
Not applicable	61 (15.5)
Health problems of other members	
Diarrhea only	63 (16.0)
Diarrhea and vomiting	26 (6.6)
Malaria	192 (48.9)
Abdominal pain with passage of muco-bloody stool	26 (6.6
Respiratory infection	48 (12.2
Others	38 (9.7)
Household with cases of diarrhea and or vomiting in the past 6 months	
Yes	238 (60.6)
No	155 (39.4)
Members of household with scabies	
Yes	71 (18.1)
No	322 (81.9)
Factors that caused diarrhea and or vomiting	
Drinking bad water	15 (3.8)
Preparing food with bad water	8 (2.0)
Not washing hand before eating	25 (6.4)
Don't know	149 (37.9)
Others	41 (10.4)
Not applicable	155 (39.4)
Ways of preventing the occurrence of diarrhea and vomiting	
Storing water in safe and clean containers	128 (32.6)
Treat water for drinking at home	71 (18.1)
Protect water sources from contamination	140 (35.6)
Improve household sanitation and personal hygiene	134 (34.1)
Others	51 (13.0)

unfavorable for drinking.[3] Analysis of different water samples showed that none of the stored water samples was found to have a significant coliform count but some proportion of samples from tap, well and borehole had significant coliform count. Probably during the storage some natural process and treatment technique at household level seem to be effective whereas the sources with coliform count are an indication of recent fecal contamination of the sources by the practice of open defecation. Although large proportion of the household does not have toilet facility and they engage in open defecation, the stream water showed no growth. The explanation of this finding is that the stream is little further from the community and the rainfall that could have facilitated washing of soil surface into the river had not started as at the time of this study. The finding of *S. aureus* in the water source is best explained by the study finding of the fact that children convey most of the drinking water to their households and this consequently contaminate water sources although *S. aureus* is not a waterborne pathogen.

The study showed that more than half of the households in the study area had a sanitary facility and four out of 10 households uses improved sanitary facilities. Similar positive findings were reported for semi-urban communities in River state by Ordinioha and Owhondah from Nigeria,[17] Admassu *et al*. from Ethopia,[18] and Banda *et al*. from India.[19] The WHO/United Nations Children's Fund (UNICEF) update on sanitation revealed that only 31%[20] of household population have access to basic sanitation while 44%[4] were reported in UNICEF annual report for United Kingdom's department for international development to have improved sanitary facility.

This study found out that four out of 10 persons practice open defecation and also up to two-third of the households reported disposing their children's feces in an open unhygienic manner. This has been documented to be happening in many low-income countries, where feces of young children are often disposed of unsafely despite that children's feces present greater health risk than adults due to the high prevalence of diarrhea-causing pathogen among them shedding more pathogens in the environment.[4] The findings are similar to the report from the NDHS conducted in 2013 where it was reported that a significant proportion of Nigerian population practice open defecation.[10]

More than two-third of the respondents reported washing their hands always after using toilet even though only two-third uses soap and water while majority use only water. This is not surprising as nearly all the respondents are Muslim whose religion prescribed hand washing after each toilet uses as part of purification. Similar study conducted in Ethiopia although among students revealed that two-third admitted that washing hands after defecation is important, although only 15% were reported to consistently carry out the practice.[20] However, with respect to materials used for hand hygiene, this study reported only two-third of the respondent using soap and water. This is consistent with findings of similar studies in Angolela, Ethiopia of 36.2%,[19] the Philippines of 37.7%,[21] and Turkey of 42.4%.[22] Diarrhea was identified as a most common waterborne disease with period prevalence for greater than half of the household respondents reporting diarrhea as their major health problem. This is very much higher than the national average of 18.8%.[17] Most of the household water sources were from unimproved source, and

the water stored at home for drinking is also accessible to children. Unsafe sanitation is major risk factor for diarrheal diseases. Open defecation by adult and unhygienic disposal of children feces, which is a prevalent practice could be attributed to the endemicity of diarrheal disease in the community. To reverse the trend, the community must have access to sanitation facility that ensures hygienic separation of human excreta from immediate human contact. This will thereby prevent infection caused by the ingestion or contact with human feces (the "fecal-oral" route of transmission).

CONCLUSION

This study revealed a proportion of contaminated drinking water sources from a peri urban community with a large proportion of households having inadequate sanitary facilities. Diarrheal disease was the major health problem. Therefore, promoting sanitation through demand creation and changing behavior of general public together with provision of accessible portable water and sanitation facilities are highly recommended.

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