

RESEARCH ARTICLE

Socio-Demographic Determinants of Water Sanitation Awareness and Practices in Marka District, Somalia

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ABSTRACT

Access to safe water, sanitation, and hygiene is critical for public health, particularly in regions facing infrastructural and environmental challenges. This cross-sectional study assessed the awareness and practices related to water sanitation and hygiene among 150 residents of Marka District, Somalia, between June 2023 and April 2024. A stratified random sampling method was employed, and data were collected using self-administered questionnaires and direct observations. Among 150 respondents in Marka District, Somalia, the majority were young adults aged 21–25 years (73.3%) and male (65.3%). Most participants were illiterate (64.0%), with only 36% having primary, secondary, or university-level education. Residential distribution showed 56.7% lived in host villages and 43.3% in IDP settlements. Employment varied, with 32% employed full-time, 13.3% part-time, 28% students, and 26.7% unemployed. The findings indicate low awareness, with 45% unaware of climate change impacts, 42% unaware of improper water handling effects, 48% not recognizing open defecation risks, and 44–50% unaware of contamination from animal feces and sanitation facilities. Most respondents (78.7%) reported knowing how to use Aqua Tap systems, and groundwater was the preferred water source (53.3%). Education level was significantly associated with sanitation awareness ($\chi^2 = 18.64$, $p = 0.001$), and residence type correlated with water source preference ($r = 0.46$, $p = 0.004$). Residential income significantly influenced sanitation practices ($\chi^2 = 15.8$, $p = 0.003$), with 40% demonstrating good practices, more frequently among IDPs (26.7%) than host village residents (13.3%). Education, residence, and income influence sanitation, with illiterate and low-income groups showing poorer practices, emphasizing the need for targeted education and better WASH facilities.

Keywords: Water sanitation; Hygiene practices; Awareness; WASH; Marka District

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1. Introduction

Access to clean water, adequate sanitation, and proper hygiene is a fundamental human right and one of the cornerstones of improving public health worldwide. Yet, over 850 million people globally lack reliable access to safe water, and more than 2.5 billion individuals face significant challenges in accessing basic sanitation facilities^[1]. The importance of water, sanitation, and hygiene (WASH) cannot be overstated, as it plays a crucial role in safeguarding health, reducing the burden of waterborne diseases, and promoting the overall well-being of communities. Improvements in WASH systems lead to substantial health benefits, including the reduction of healthcare costs, increased productivity, and the prevention of diseases associated with unsafe water and inadequate sanitation. Despite global advancements in water and sanitation infrastructure, many regions, particularly in developing countries, continue to face severe challenges in ensuring equitable access to these basic services^[2].

In Sub-Saharan Africa, the lack of access to clean water and sanitation facilities remains a pressing public health issue. According to the World Health Organization (WHO), nearly 40% of the population in sub-Saharan Africa lacks access to safe drinking water, and around 70% lacks adequate sanitation facilities^[3]. This disparity is particularly evident in rural areas, where people often rely on unsafe water sources and unsanitary practices, which exacerbate the spread of waterborne diseases like cholera, dysentery, and malaria^[4]. Inadequate sanitation not only increases the risk of waterborne diseases but also has broader economic consequences, leading to lost productivity, increased healthcare costs, and greater educational disruptions, particularly for women and children. According to the United Nations Children's Fund (UNICEF), poor sanitation and hygiene^[5].

In Somalia, a country already burdened by political instability, an arid climate, and inadequate infrastructure, the situation is particularly dire. Somalia's reliance on scarce water resources, such as underground aquifers and seasonal rivers, leaves much of the population vulnerable to water shortages^[6]. The lack of safe drinking water and poor sanitation practices contribute significantly to the spread of diseases such as cholera, typhoid fever, and other gastrointestinal infections. The country's healthcare system is stretched thin, struggling to cope with the rising tide of waterborne diseases that disproportionately affect children, the elderly, and pregnant women. This public health crisis is further exacerbated by a lack of education and awareness surrounding proper sanitation and hygiene practices, which leads to the widespread adoption of unsafe practices, including open defecation and improper waste disposal^[7].

The challenges in Somalia's WASH sector are multifaceted. Poor sanitation infrastructure, water contamination due to high salinity levels, and over-extraction of groundwater are just a few of the issues that contribute to the country's struggle with providing safe and clean water to its people. Additionally, ongoing conflict and lack of governance in some regions have made it difficult to implement and sustain long-term water and sanitation solutions. In many urban and rural areas, particularly in regions like Wadajir District, the population continues to rely on unsafe water sources, and access to clean sanitation facilities is limited or non-existent. As a result, Somalia has one of the highest rates of waterborne diseases in the world, and the health and economic impacts are staggering^[8].

In Africa as a whole, the lack of access to WASH services has led to widespread health crises. Poor sanitation and unsafe drinking water are responsible for a significant portion of the continent's preventable diseases and deaths. The World Bank estimates that inadequate water and sanitation cost sub-Saharan Africa over \$5 billion annually in lost productivity. Furthermore, the region is home to many slums and informal settlements where access to safe water and sanitation is limited. As urban populations continue to grow, the

strain on existing water and sanitation systems intensifies, making it increasingly difficult to meet the needs of the people^[9].

The persistent challenges in the WASH sector in Somalia and Sub-Saharan Africa highlight the urgent need for more focused research and action. Without significant improvements in water supply, sanitation facilities, and hygiene practices, the health burden will continue to grow, disproportionately affecting vulnerable populations^[10]. Addressing these challenges requires not only infrastructure development but also comprehensive education and awareness programs to change behaviors and improve hygiene practices. There is also a need for stronger governance and coordination among governments, international organizations, and local communities to ensure that water and sanitation services are sustainable and equitable. This study aims to assess the awareness and practices related to water, sanitation, and hygiene among residents in selected areas of Somalia, and to identify key socio-demographic factors influencing these practices.

2. Methodology

2.1. Study setting, design and sampling method

The study was conducted in Marka District, located in the Lower Shabelle Region of Somalia, an area characterized by high population density and limited access to water, sanitation, and hygiene (WASH) services among both IDPs and host villages areas. A cross-sectional quantitative research design was employed, involving data collection from a representative sample of the population at a single point in time. The study was conducted over a period of ten months, from June 2023 to April 2024, with a sample size of 150 participants determined using a standard sample size calculation formula for finite populations. To ensure a representative sample, a stratified random sampling method was used, where the population was stratified by key demographic variables such as age, gender, and education level, and a proportional number of participants were selected from each stratum using a computer-generated random number system.

2.2. Data collection

Data collection was carried out using a self-administered questionnaire and direct observations. The questionnaire was designed to gather information on participants' demographic characteristics (e.g., age, gender, marital status, education, income), awareness of water safety, sanitation practices, views (e.g., beliefs about the importance of proper sanitation and hygiene), and practices (e.g., water source usage, handwashing practices, sanitation methods). Additionally, direct observations were made to assess the physical conditions of water sources and sanitation facilities. The questionnaire was pre-tested in a similar setting to ensure clarity and relevance. It was reviewed for content validity with experts in WASH and public health to ensure its appropriateness for the target population.

2.3. Inclusion and exclusion criteria

The inclusion criteria for this study were as follows: participants must be permanent residents of Marka District, Lower Shabelle Region, Somalia, aged 18 years or above, and willing to provide informed consent to participate in the study. The exclusion criteria included individuals who are not permanent residents of Marka District, as well as those who refuse to provide informed consent or are unable to participate due to physical or cognitive limitations, such as severe illness or mental incapacity.

2.4. Ethical considerations

The study protocol was submitted for ethical review and approval to the Research Ethics Committee (REC) of the Faculty of Allied Health Sciences (FAHS), Daffodil International University (DIU). Informed consent was obtained from all participants after they were fully briefed on the study's purpose, their role, and

any potential risks. Confidentiality was strictly maintained, with all data anonymized and no personally identifying information collected. Participation was voluntary, and participants had the right to withdraw at any time without facing any consequences.

2.5. Statistical analysis

Data were analyzed using SPSS. Descriptive statistics (frequencies, percentages, means, medians) summarized demographic and WASH-related variables. Chi-square tests and correlation analysis were used to examine associations between socio-demographic factors and WASH practices. A p-value of less than 0.05 was considered statistically significant.

3. Results

The socio-demographic data in Table 1 reveal that the majority of respondents were male (65.3%), indicating a slightly higher participation rate among men compared to women (34.7%). Most of the respondents (73.3%) fell within the 21–25-year age group, reflecting a predominantly young population actively engaged in education or early stages of employment.

In terms of marital status, half of the respondents (50%) were single, followed by 30% who were married, and a smaller proportion (16.7%) who were engaged, suggesting that most participants were in the younger, unmarried demographic segment. Regarding educational background, 36.0% of respondents had literate and the majority (64.0%) were illiterate.

Table 1. Socio-Demographic Profile of Respondents (n = 150)

Variable	Category	Frequency	Percentage (%)
Gender	Male	98	65.3
	Female	52	34.7
Age Group (Years)	15–20	14	9.3
	21–25	110	73.3
	26–30	22	14.7
	31–35	4	2.7
	36–40	0	0.0
Marital Status	Single	75	50.0
	Married	45	30.0
	Engaged	25	16.7
	Separated	5	3.3
Education Level	Literate	54	36.0
	Illiterate	96	64.0

Table 2 shows the employment, residential, income status of the respondents. A majority of participants (56.7%) resided in host villages, while 43.3% lived in IDPs settings, reflecting a slightly higher representation from host villages communities. Regarding occupation, 32% of respondents were used full-time, 13.3% were used part-time, and 28% were students, indicating an active, working-age population. The remaining 26.7% were unemployed, highlighting the diversity in economic engagement among the respondents.

Table 2. Employment and Residence of Respondents (n = 150)

Variable	Category	Frequency	Percentage (%)
Occupation	Used (Full-time)	48	32.0
	Used (Part-time)	20	13.3
	Student	42	28.0
	Unemployed	40	26.7
Place of Residence	IDPs	65	43.3
	Host Villages	85	56.7
Income Level	\$100–\$200	65	43.3
	\$50–\$100	85	56.7

Table 3 presents respondents' awareness regarding water sanitation and hygiene. The results indicate low awareness among many participants, as a considerable proportion did not recognize major sanitation-related factors. About 45% of respondents were unaware that climate change contributes to poor sanitation, while 42% did not acknowledge the negative effects of improper water handling. Similarly, 48% of participants did not recognize the impact of open defecation on hygiene. Awareness was also limited regarding contamination from animal feces and sanitation facilities, with 44% and 50% of respondents, respectively, failing to identify these as contributors to water contamination.

Table 3. Respondents' Awareness Regarding Sanitation (n = 150)

Statement	Response	Frequency	Percentage (%)
Climate change contributes to poor water sanitation and hygiene	Yes	82	54.7
	No	68	45.3
Improper water handling causes poor sanitation	Yes	87	58.0
	No	63	42.0
Open defecation contributes to poor sanitation	Yes	78	52.0
	No	72	48.0
Animal feces affect water sources	Yes	84	56.0
	No	66	44.0
Sanitation facilities can cause water contamination	Yes	75	50.0
	No	75	50.0

Table 4 highlights respondents' awareness and practices related to water sanitation. A substantial proportion of participants (78.7%) reported knowing how to use Aqua Tap, indicating familiarity with modern water treatment technologies. Awareness of health problems caused by poor sanitation was also high, with 80% recognizing the risks, particularly cholera (43.3%) and diarrhea (38.7%), followed by typhoid (18%). Regarding preferred water sources, groundwater was the most commonly used (53.3%), reflecting reliance on natural and easily accessible sources, followed by spring-fed wells (20%), shallow wells (16.7%), and boreholes (10%).

Table 4. Respondents' Awareness and Practices Related to Water Sanitation (n = 150)

Variable	Category	Frequency	Percentage (%)
Know how to use Aqua Tap	Yes	118	78.7
	No	32	21.3
Awareness of health problems caused by poor sanitation	Yes	120	80.0
	No	30	20.0
Types of problems reported	Cholera	65	43.3
	Diarrhea	58	38.7
	Typhoid	27	18.0
Preferred water source	Groundwater	80	53.3
	Spring-fed wells	30	20.0
	Shallow wells	25	16.7
	Boreholes	15	10.0
Type of latrine used	Pit latrine	105	70.0
	Flush toilet	30	20.0
	Open defecation	15	10

Table 5 shows a significant association between education level and sanitation awareness ($\chi^2 = 18.64$, $p = 0.001$). Of the respondents, 36% were literate and 64% illiterate. High awareness (31%) was mostly among literate participants, particularly secondary (15/18) and university-educated (10/10), while the majority of illiterate respondents (84/96) had low awareness. These results highlight that higher education is strongly linked to better sanitation awareness.

Table 5. Association Between Education Level and Awareness of Sanitation (n = 150)

Education Level	High Awareness	Low Awareness	Total	χ^2	p-value
Primary	10 (6.7%)	16 (10.7%)	26 (17.3%)	18.64	0.001
Secondary	15 (10.0%)	3 (2.0%)	18 (12.0%)		
University	10 (6.7%)	0 (0%)	10 (6.7%)		
Illiterate	12 (8.0%)	84 (56.0%)	96 (64.0%)		
Total	47 (31.0%)	103 (69.0%)	150 (100%)		

Table 6 illustrates the correlation between respondents' type of residence and their preferred water source. A moderate positive correlation was observed ($r = 0.46$, $p = 0.004$), indicating a significant relationship between residence and water source preference. Host villages residents predominantly relied on groundwater (36.7%) and shallow wells (8.7%), reflecting dependence on natural and locally available water sources. In contrast, IDPs residents more commonly used spring-fed wells (13.3%) and boreholes (5.3%), suggesting greater access to constructed water infrastructures.

Table 6. Correlation Between Residence and Water Source (n = 150)

Residence Type	Groundwater	Spring-fed Wells	Shallow Wells	Boreholes	Total
IDPs (n = 65)	25 (16.7%)	20 (13.3%)	12 (8.0%)	8 (5.3%)	65 (43.3%)
Host villages (n = 85)	55 (36.7%)	10 (6.7%)	13 (8.7%)	7 (4.7%)	85 (56.7%)
Total	80 (53.3%)	30 (20.0%)	25 (16.7%)	15 (10.0%)	150 (100%)

Table 7 shows a significant association between residential income and sanitation practices ($\chi^2 = 15.8$, $p = 0.003$). Among the respondents, 43.3% were from host villages earning \$100–\$200/month, while 56.7% were IDPs earning \$50–\$100/month. Good sanitation practices were observed (Table 7).

Table 7. Correlation Between Income and Sanitation Practices (n = 150)

Residence / Income	Good Practices	Poor Practices	Total	χ^2	p-value
Host Villages (\$100–\$200/month)	20 (13.3%)	45 (30.0%)	65 (43.3%)	15.8	0.003
IDPs (\$50–\$100/month)	40 (26.7%)	45 (30.0%)	85 (56.7%)		
Total	60 (40.0%)	90 (60.0%)	150 (100%)		

4. Discussion

The present study provides insights into socio-demographic characteristics, water sanitation awareness, and practices among residents of Marka District, Somalia. The findings indicate that the majority of respondents were young adults (21–25 years, 73.3%), male (65.3%), and predominantly rural residents (56.7%). This demographic pattern aligns with the population structure in many Sub-Saharan urban–rural transition areas, where youth participation in surveys tends to be higher due to their accessibility and willingness to engage in research activities.

The distribution of gender and age suggests that water, sanitation, and hygiene (WASH) interventions in Marka District should consider the needs of young adults, particularly men, who are often responsible for household water collection in rural communities. The education level of respondents showed that 36.0% had educated and the majority (64.0%) were illiterate. This low level of formal education is consistent with previous studies in similar contexts, where limited access to education constrains knowledge dissemination regarding sanitation and hygiene^[11,12]. High illiteracy among respondents may hinder the adoption of optimal hygiene practices, underscoring the need for targeted educational interventions.

Table 3 shows low awareness among respondents regarding water sanitation and hygiene. Around 45% were unaware of the impact of climate change, and 42% did not recognize the effects of improper water handling. Nearly half (48%) did not identify open defecation as a sanitation concern. Similarly, 44% and 50% lacked awareness about contamination from animal feces and sanitation facilities, respectively. Knowledge of sanitation-related health problems was also high (80%), particularly cholera (43.3%) and diarrhea (38.7%). Most participants (78.7%) reported knowing how to use Aqua Tap systems, and groundwater was the preferred source for 53.3% of respondents, especially among rural residents, consistent with findings from similar rural settings in Africa and South Asia^[13,14].

Education level was significantly associated with sanitation awareness ($\chi^2 = 18.64$, $p = 0.001$; Table 5). Only 36% of respondents were literate, and high awareness (31%) was concentrated among literate participants, particularly secondary (15/18) and university-educated respondents (10/10), while the majority of illiterate participants (84/96) had low awareness. These results confirm that education is a key determinant of sanitation knowledge and practices^[15].

A moderate positive correlation was observed between residence type and preferred water source ($r = 0.46$, $p = 0.004$; Table 6). Host village residents primarily relied on groundwater (36.7%) and shallow wells (8.7%), whereas IDPs more often used spring-fed wells (13.3%) and boreholes (5.3%). This underscores the influence of infrastructure and environmental context on water source selection, consistent with findings from Kenya and Ethiopia^[16].

Residential income was also significantly associated with sanitation practices ($\chi^2 = 15.8$, $p = 0.003$; Table 7). Good sanitation practices were reported by 40% of participants, with a higher proportion among IDPs (26.7%) than host village residents (13.3%), while 60% reported poor practices. These findings highlight the combined impact of economic status and residential context on WASH behavior in Marka District. Regarding demographics, half of the respondents were single (50%), 30% married, and 16.7% engaged, suggesting a predominantly young and unmarried population. Educational attainment was low: 17.3% had primary education, 12.0% secondary, 6.7% university-level qualifications, and 64.0% were illiterate, emphasizing the need for targeted educational interventions to improve sanitation practices.

5. Conclusion

The study highlights that sanitation awareness and practices in Marka District, Somalia, are strongly influenced by education, residence, and income. A majority of respondents were young, male, and predominantly illiterate, with only 36% being literate. High sanitation awareness (31%) was mostly observed among literate participants, particularly those with secondary or university education, while the majority of illiterate respondents exhibited low awareness. Water source preference and sanitation practices were significantly associated with residential context and income, with rural and lower-income populations relying more on natural water sources and demonstrating poorer sanitation practices. These findings underscore the critical need for targeted educational interventions and improved water and sanitation infrastructure to enhance WASH behaviors, particularly among illiterate and economically disadvantaged communities in Marka District.

6. Limitations

The study has several limitations that should be noted:

- **Cross-sectional design:** The study captures information at a single point in time, limiting the ability to establish causal relationships between socio-demographic factors and sanitation practices.
- **Sample representation:** Although the sample reflects the Marka District population, it may not fully represent the diversity of the broader region or other districts in Somalia.
- **Self-reported data:** Reliance on self-reported responses may introduce recall bias or social desirability bias, potentially overestimating participants' knowledge and practices.
- **Limited water quality assessment:** The study focused mainly on basic water sources and did not evaluate detailed water quality parameters or seasonal variations that could influence sanitation behaviors.
- **Resource constraints:** Logistical limitations restricted in-depth qualitative exploration, which might have provided richer insights into cultural, behavioral, and infrastructural factors affecting WASH practices.

These limitations indicate the need for future studies with larger, multi-district samples, longitudinal designs, and combined qualitative-quantitative approaches to gain a more comprehensive understanding of water, sanitation, and hygiene challenges in Somalia.

Conflict of interest

The authors declare no conflict of interest

References

1. Wasonga J, Okowa M, Kioli F. Sociocultural determinants to adoption of safe water, sanitation, and hygiene practices in Nyakach, Kisumu County, Kenya: a descriptive qualitative study. *Journal of Anthropology*. 2016;2016(1):7434328.
2. Kithuki K, Opanga Y, Watulo E, Marita E. Water, sanitation and hygiene coverage and practices of a semi-arid county in the Eastern region of Kenya. *Journal of Water, Sanitation and Hygiene for Development*. 2021 Mar 1;11(2):327-34.
3. World Health Organization. WHO global water, sanitation and hygiene: annual report 2020. World Health Organization; 2021 May 31.
4. Ondieki JK, Akunga DN, Warutere PN, Kenyanya O. Socio-demographic and water handling practices affecting quality of household drinking water in Kisii Town, Kisii County, Kenya. *Heliyon*. 2022 May 1;8(5).
5. Unicef, Unicef. Strategy for water, sanitation and hygiene 2016-2030.
6. Tahlil AA, Dahir MA, Hassan YS, Osman MM, Dahir G, Jimale LH, Siyad AA, Mohamed MA, Fiidow OA, Osman AY. Knowledge, attitude, and practice of water, sanitation, and hygiene among internally displaced persons in Somalia. *Journal of Health, Population and Nutrition*. 2025 Aug 21;44(1):303.
7. Bakaal FM, Abdi HI, Omar MA, Olow AM, Mohamed MN, Hussein AI, Hussein NA. Knowledge and awareness about water sanitation and hygiene practice among the selected urban area in Somalia. *Ecological Risk and Security Research*. 2024;2(2):9168.
8. Ali MA, Farih OA, Abokor AH, Abdikarim H, Yousuf AM, Muse AH. Exploring the determinants of water, sanitation, and hygiene (WASH) status in Somalia: a multilevel mixed-effects modeling approach using a nationwide survey. *Journal of Water, Sanitation and Hygiene for Development*. 2025 Apr 1;15(4):333-54.
9. Ohwo O, Agusomu TD. Assessment of water, sanitation and hygiene services in sub-Saharan Africa. *European Scientific Journal*. 2018 Dec 31;14(35):308-26.
10. Ahmed HA, Ali DA. Prevalence and determinants of household access to improved latrine utilization in Somalia: health demographic survey (SHDS) 2020. *Environmental Health Insights*. 2024 Sep;18:11786302241284148.
11. Atangana E, Oberholster PJ. Assessment of water, sanitation, and hygiene target and theoretical modeling to determine sanitation success in sub-Saharan Africa. *Environment, Development and Sustainability*. 2023 Nov;25(11):13353-77.
12. Mafuta W, Zuwarimwe J, Kamuzhanje J, Mwale M, Chipaike R. Sustainable Conflict Resolution through Community Based Water, Sanitation and Hygiene (WASH) Planning in Fragile and Conflict Situations: The Case of Somalia. *Journal of Asian and African Studies*. 2021 Mar;56(2):352-63.
13. Zerbo A, Delgado RC, González PA. Water sanitation and hygiene in Sub-Saharan Africa: Coverage, risks of diarrheal diseases, and urbanization. *Journal of Biosafety and Biosecurity*. 2021 Jun 1;3(1):41-5.
14. World Health Organization. WHO Global water, sanitation and hygiene: annual report 2022. World Health Organization; 2023 Aug 21.

15. Murei A, Mogane B, Mothiba DP, Mochware OT, Sekgobela JM, Mudau M, Musumuvhi N, Khabo-Mmekoa CM, Moropeng RC, Momba MN. Barriers to water and sanitation safety plans in rural areas of South Africa—a case study in the Vhembe District, Limpopo Province. *Water*. 2022 Apr 12;14(8):1244.
16. Naik I. Study on Knowledge Attitude Practices on Personal and Water Hygiene among Peri-urban and Rural People of Ganderbal District (Doctoral dissertation, SKUAST Kashmir).