

Factors associated with sanitation practices preventing diarrhea at household-level in Mogadishu, Somalia

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ABSTRACT

Introduction: Poor sanitation is responsible for the mortality and morbidity related to diphtheria worldwide, particularly under-five years children. The World Health Organization (WHO) estimated that 2.39 billion children under five had diarrhea. Diarrhea is one of the major causes of all child deaths from water contamination, improper sanitation, or hygienic practices. This study aimed to investigate factors associated with diarrhea in homes with children under five years old in Hodan District, Mogadishu, Somalia.

Methods: A cross-sectional study was conducted in the Hodan district of Mogadishu, Somalia, from December 2021 to February 2022. The study participants were randomly selected from 241 households. Descriptive statistics were processed, and logistic regression analysis was used to detect factors associated with diarrhea that related to sanitation practice at a significant level of $\alpha = 0.05$.

Results: More than 60.6% of the participants lived in multi-family homes, and 81.3% of households lacked access to handwashing facilities. Among 29% of households had poor sanitation conditions. Residences with multi-family homes was associated with diarrhea in children under five years (p -value= 0.004), followed by families whose inhabitants in IDP areas were statistically significant (p -value= 0.001). Family income had a nearly increased risk of diarrhea occurrence in children (p -value =0.001). The households with dependent pit latrines without slabs had (p -value= 0.011). Participants who did not use drinking water treatment were their children highly associated with developing diarrhea compared to those who treated their drinking water at home (p -value=0.003). Families who did not adequately cover their food during preparation had correlated diarrhea in their children compared to those who maintained safe food handling (p -value=0.029).

Conclusion: Providing adequate water, hygiene, and sanitation services in the Hodan district is vital for diarrheal prevention. Awareness-raising at a household level improved sanitation facility, and sanitation practices and encouragement should be scaled up accordingly. Further in-depth studies related to the WASH services gap should also be conducted.

Keywords: Diarrhea, Hygiene, Household, Sanitation Practices, Water

Introduction

Poor sanitation is responsible for 4% of mortalities and 5.7% of morbidity worldwide, particularly among under-five children [1]. Children under five experience 2.5 billion cases of diarrhea each year, and estimates indicate that overall incidence has remained largely stable over the last two decades [2]. A lack of safe drinking water, inadequate sanitation, poor hygiene, and overcrowding continue to be major

contributors to diarrhea in children in low- and middle-income countries [3]. These diarrheal infection determinants are related to poverty and sanitation aspects [4]. According to comparable research, more than 94% of diarrhea episodes can be prevented by improving sanitation and promoting hygiene [5]. However, poor sanitation practices are also responsible for diseases such as trachoma and parasitic intestinal

infections that contribute to an additional burden of diseases, affecting public health [6].

Indeed, 90% of diarrhea-related deaths occur in South Asia and Sub-Saharan African countries including Somalia. More than half of all diarrhea deaths in children under five years old occur in just 15 African and Asian nations. Somalia is one of many African countries with high diarrhea rates. On the other hand, unexpectedly, a different study revealed that child mortality in sub-Saharan Africa is 15 times higher compared to the developed world, [7]. On the other hand, in a healthy child, a single incidence of diarrhea is typically self-limiting and has no long-term sequels. Besides, several episodes per year can lead to nutritional deficits and long-term consequences, [8]. Sanitation is the maintenance of sanitary conditions through safe feces disposal, and wastewater disposal to separate human excreta from human touch at all sanitation facilities sequence, and wastewater disposal [9].

The risks associated with poor household sanitation practices predominantly affect vulnerable people suffering from diarrhea caused by polluted water sources. Due to insufficient water storage containers, shortage of latrines, living in a house with few rooms, and not exclusively breastfeeding for the first six months of life, diarrhea remained a significant public health issue for under-five children in Somalia [4]. Increased demand for inadequate systems and services puts cities in danger of large-scale illness outbreaks linked to poor sanitation, since, there have been few long-term interventions in this sector, and the ability for new changes is limited, due to limited resources [10]. The availability of latrines, household sanitation facilities, water handling, type of water supply, and infant feces disposal were all factors that contributed to the risk of acute childhood diarrhea. This result can potentially increase the frequency of diarrheal disease in Mogadishu, particularly in informal settlement sites [11].

The second-leading cause of death in children under five years is diarrheal disease. However, approximately 525,000 children under five die from diarrhea each year [12]. In Mogadishu, Somalia, inadequate sanitation services at the households cause the reoccurrence of acute watery diarrhea in under-five children [12]. A significant portion of diarrheal disease can be avoided through safe drinking water, adequate sanitation, and good hygiene [13]. However, a few studies in the Hodan district, Mogadishu, Somalia research site highlighted the importance of residential sanitation practices concerning diarrhea incidence resulting in infections triggered by water caused by poor hygiene, sanitation, and overpopulation, [13]. Therefore, this study aimed to determine the factors associated with diarrhea related to sanitation practices in homes with children under five years in Hodan District, Mogadishu, Somalia.

Methodology

Study design

A cross-sectional study design was utilized. The study population involved all households with children aged less than five years. This research takes place in the Hodan district of Mogadishu, Somalia, between 15th December 2021 and 28th February 2022.

Study samples

Kish Leslie's (1965) formula for cross-sectional studies was calculated using sample size calculation with a level of confidence of 1.96, a margin of error of 0.05, and a baseline indicator level was = 0.17 [14]. The number of households was 3,210 households. The calculated sample size was 217 respondents. With 10% added to the response rate, a final total of 241 respondents were collected in case of incomplete data from the required quota. These households are based on the estimated population proportion size from the district plan. A systematic sampling technique was used to select households in the Hodan district, including the internally displaced people (IDP) section, particularly homes with under five children who have lived in the study site, for more than five years. Participants who met the inclusion criteria were interviewed to obtain information about socio-demographic characteristics, access sanitation factors, and risk factors of diarrhea among households having under five years children. The main household informants were mothers or caretakers for selected children under five years.

The trained enumerators then were approached and explained the purpose of the study to the selected caregivers; allowing them to ask questions on areas that were not clear to ensure that they understood the purpose and the procedure to be followed before signing a consent form concurrence were recruited into the study. Each household was selected as one caregiver.

Inclusion and exclusion criteria

The study included households with children under five years old who lived in the Hodan district for at least five years. All households without children under five were excluded from the study. The assessment also eliminated persons who had only lived in the Hodan district for less than five years and children whose families did not consent to be part of the study.

Validity and reliability

The researcher recruited four enumerators experienced in human research ethics. Then, instruments were pre-tested for an interview before data collection to check the appropriateness of the questionnaires. Some amendment was made after the pre-test. Data were gathered using the interview techniques with an observation checklist. In selected households, trained data collectors interviewed each

respondent. A structured questionnaire was developed to gather data on families with children under five years old at the study site. The questionnaire is divided into two sections; The first part; assesses the socio-demographics of households, comprising age, gender, marital status, education, occupation, and home ownership. Section two comprises aspects of the collection of household predictor variables for diarrhea in the Hodan district, Mogadishu, Somalia. However, the dependent variable for the study was diarrhea under five years.

Data analysis

SPSS version 26 was used to enter, code, clean, and analyze the data. Accordingly, the descriptive level was analyzed and presented using tables, frequencies, and percentages. Binary and logistic regressions were used to assess the association of various sanitation factors of childhood diarrhea using an unadjusted odds ratio and adjusted odds ratio with a corresponding 95% confidence interval, to determine any statistically significant relationship between sanitation practices and diarrhea. A p-value of less than 0.05 was considered statistically significant.

Ethical considerations

The Ministry of Health and Human Services Ethical and Research Committee approved the study in Somalia with reference no. MOH&HS/DGO/1947/DEC/2021. The Hodan District Commissionaire also permission was obtained. Informed written consent was obtained from all respondents before interviewing and house-to-house observation.

Results

Socio-demographic characteristics of the study participants

In this study, 241 participants were interviewed. Of these, 80.9% were female. The majority of participants were between the age of 26-35 (46.1%) and the age of 36-45 (23.7%). The majority of participants were illiterate (44.0%), 70.1% were unemployed, and 37.3% had approximately 200 dollars.

Majority (60.6%) of respondents were residents of multi-family homes, and the number of family members per household varied as most of them lived in a home of 5-10 persons (58.1%). Most participants lived in rental houses (51.9%), as 24% lived in government-owned houses. All of the study households had available toilet facilities. Children experienced diarrhea in the last two weeks were under 35 months, and the majority believed diarrhea was a health risk.

Table 1 Socio-demographic characteristics of the study participants (n=241)

Characteristics	n	%
Gender		
Male	46	19.1
Female	195	80.9
Age (mothers)		
18-25	37	15.4
26-35	111	46.1
36-45	57	23.7
46-55	23	9.5
56-65	13	5.4
Educational status		
Primary	53	22.0
Secondary	74	30.7
University	8	3.3
Illiterate	106	44.0
Marital status		
Married	199	82.6
Unmarried (single, widowed, divorced)	42	17.4
Occupational status		
Employed	72	29.9
Unemployed	169	70.1
Family income per month		
Less than \$ 100 US	62	25.7
Between \$ 100 to 200 US	89	36.9
More than \$ 200 US	90	37.3
Kind of house		
Single-family homes	88	36.5
Multi-family homes	146	60.6
Apartments	7	2.9
Family members (persons)		
1-5	49	20.3
5-10	140	58.1
Over 10	52	21.6
House ownership		
Owner	58	24.1
Rented from private	125	51.9
Government home	58	24.1
Number of under five years old (persons)		
≤ 3	103	42.7
≥ 4 children	138	57.3
Child experienced diarrhea		
Yes	74	30.7
No	167	69.3
If yes what was child (months)		
0 - 11	18	7.5
12 - 23	47	19.5
24 - 35	9	3.7

WASH risk factors of diarrhea among households having under five years children

The water, sanitation, and hygiene risk factors where around 32.4% of the households practiced pit latrines without slabs, whereas 32.0% had squat toilets with water flush latrines, but 71.4% of the respondents used clean restrooms, and 28.6% used unclean baths. 40.7% refused to practice the garbage disposal methods, and 24.1% reported they discarded in an open area. 71.0% had good household sanitation conditions, and 98.8% had used pipe water supply regarding the water sources. 53.5% used buckets with a lid for water storage at the household level, whereas 7.5% had Jerri cans. Almost 45.2% of participants practiced chlorination for water treatment, while only 4.6% used filtration (Table 2).

Table 2 WASH risk factors of diarrhea among households having under five years children

Characteristics	n	%
Type of latrine		
Sit-down toilet with water flush	47	19.5
Squat toilet with water flush	77	32.0
Pit latrine without slab/open pit	78	32.4
Dry toilet	39	16.1
Cleanliness of the latrine		
Clean	172	71.4
Unclean	69	28.6
Garbage disposal		
Refuse disposal method	98	40.7
Disposed into open pit	85	35.3
Discarded in open area	58	24.1
Household sanitation condition		
Good	171	71.0
Poor	70	29.0
Source of water		
Pipe	238	98.8
Borehole	3	1.2
Water storage at household		
Bucket with a lid	129	53.5
Bucket without a lid	38	15.8
Jerry cans	18	7.5
Water treatment		
Boiling	26	10.8
Chlorination	109	45.2
Filtration	11	4.6
I don't use any method	68	28.2
Others	26	10.8
Using soap		
Yes	223	92.5
No	18	7.5
Hygiene status among children		
Good	168	69.7
Poor	73	30.3
Food preparation		
Fair	150	62.2
Good	91	37.8

Association between socio-demographic and access sanitation facilities at household-level

Being unmarried and low family income increases the risk of diarrhea in children (p-value=0.004). Meanwhile, families earning \$200 or more were nearly 29 times more likely to get diarrhea from their children (p-value=0.001). With regards to children's diarrhea is attributed to living in government-owned buildings due to old and inadequate sanitation facilities. Multi-family apartments. The neighboring section in October had 16 odds more than their counterparts (p-value was 0.003).

Table 3 Association between socio-demographic and access sanitation facilities at household-level

Factors	OR	95%CI	AOR	95%CI
Gender				
Male	1.00		1.00	
Female	0.86	0.426-1.76	0.71	0.31-1.66
Age of mother/ caretaker years				
18-25	1.00		1.00	
26-35	1.57	0.71-3.43	1.28	0.56-2.95
36-45	1.87	0.76-4.58	1.46	0.56-3.77
46-55	1.14	0.38-3.37	1.01	0.30-3.37
56-65	0.52	0.15-1.87	0.40	0.09-1.70
Marital Status				
Married	1.00		1.00	
Unmarried	0.36	0.18-0.72	0.41	0.20-0.86
Education				
University	1.00		1.00	
Secondary	0.22	0.02-1.89	0.16	0.01-1.64
Primary	0.93	0.10-8.82	0.69	0.06-7.74
Illiterate	0.26	0.00-2.24	0.24	0.04-0.38
Family income				
Less than \$ 100	1.00		1.00	
Between \$ 100-200	7.01	3.39-14.48	0.12	0.04-0.38
More than \$ 200	28.98	11.24-74.68	0.47	0.17-1.30
House ownership				
Owner	1.00		1.00	
Rented from private	1.83	0.89-3.79	2.81	1.05-7.54
Government home	0.29	0.13-0.63	3.83	1.53-9.57

Factors	OR	95%CI	AOR	95%CI
Area of residence				
Zona-K IDP area	1.00		1.00	
Kacan	6.66	2.33-19.02	0.03	0.01-0.12
Ahmed	6.38	1.74-23.37	6.38	1.74-23.37
Gurey				
Horseed	0.17	0.06-0.45	0.17	0.06-0.45
October	17.94	4.82-59.51	16.94	4.82-59.51
Kind of house				
Single-family homes	1.00		1.00	
Multi-family homes	0.03	0.01-0.02	0.00	0.00-0.00
Apartments	0.57	0.00-0.01	0.00	0.00-0.00
Number of family members				
1-5 persons	1.00		1.00	
5-10 persons	0.46	0.21-1.00	0.68	0.24-1.89
Over 10 persons	0.69	0.27-1.75	1.08	0.32-3.61
Occupational status				
Employed	1.00		1.00	
Unemployed	0.67	0.36-1.25	0.68	0.36-1.28
Number of under five years children				
Less than 3 children	1.00		1.00	
More than 4 children	1.30	0.12-2.14	1.31	0.65-2.63

*Significant level at $\alpha=0.05$

Association between WASH risk factors in diarrhea in households in children

The type of latrine that was found to be associated with childhood diarrhea, particularly in families who practice pit latrines without slabs (p-value= 0.001). The households who do not utilize any water treatment were 11.40 times which are more likely to have diarrhea in their children (Table 4).

Diarrhea was statistically associated with low attendance of children who are playing in open spaces in the IDPs and host communities (p-value=0.002). Similarly, families who do not practice well their food preparation in terms of food safety and covering immediately after cooking had odds of 14.65 (95% CI=0.562-38.15) more likely to develop diarrhea compared to those families adequately prepared food and protected any environmental risks at home. The type of latrine, water treatment, children's hygiene levels, and food handling were found to be associated with diarrhea in children.

Table 4. Association between WASH risk factors in diarrhea with children at households

Factors	OR	95%CI	AOR	95%CI
Type of latrine				
Toilet with water flush	1.00		1.00	
Toilet with water flush	0.44	0.16-1.21	6.56	2.16-186.65
Pit latrine without slab	0.13	0.05-0.36	4.39	2.37-37.11
Dry toilet	0.48	0.15-1.51	2.32	0.66-8.12
Cleanliness of the latrine				
Clean	1.00		1.00	
Unclean	1.12	0.60-2.06	1.15	0.70-3.22
Household sanitation condition				
Good	1.00		1.00	
Poor	1.73	0.91-3.29	0.78	0.36-1.68
The main source of water supply				
Pipe	1.00		1.00	
Borehole	0.88	0.07-9.91	3.31	0.03-281.71
Drinking water treatment				
Boiling	1.00		1.00	
Chlorination	4.87	0.18 -8.11	5.69	2.53-119.30
Filtration	11.00	0.17-70.67	57.98	4.30-781.26
I don't use any method	11.40	1.77-11.21	8.99	2.47-153.61
Do you use soap				
Yes	1.00		1.00	
No	2.33	0.65-8.32	1.20	0.21-6.70
Hygiene status among children				
Good	1.00		1.00	Ref
Poor	2.09	1.09-4.01	3.91	1.80-8.48
Food preparation				
Fair	1.00		1.00	
Poor	14.65	0.56-38.15	20.71	7.73-55.48
Caregiver wash hands with soap				
Yes	1.00		1.00	
No	1.77	0.20-1.57	0.95	0.22-3.96

Factors	OR	95%CI	AOR	95%CI
Type of sanitation facility				
Ecosan toilet	1.00		1.00	
Pit latrine with a slab	0.34	0.16-1.71	0.32	0.15-0.70
Pit latrine without a slap	1.56	0.61-3.97	1.58	0.62-4.05
VIP-latrine	4.85	0.02-9.12	4.57	0.01-7.74

*Significant level at $\alpha=0.05$

Discussion

The study found that 29% of the households had poor sanitation status, associated with diarrhea in children under five years old. The majority of participants resided in an overcrowded neighborhood with IDPs families, making them more prone to parasites in diarrheal diseases. This shows that those who are residents of IDPs would have a high risk of having diarrhea with their children compared to those who are living in domestic households. This aligns with earlier research reported by [15]. Both IDPs and host communities in the study site had poor sanitation practices and unclean sanitation facilities. Diarrhea was 73 times more likely to occur in children living in households that did not consider it a health risk.

Although this study was conducted in Mogadishu it is presented, that disposal of waste, household water handling, water source, handwashing behaviors, and improper infant feces disposal were risk factors for sanitation practices in Somalia. Adults from IDPs sometimes practiced open defecation, as reported by [11].

The study also found that 84.2% of homes had private latrines whereas 15.8% had public latrines. The status of IDPs is characterized by high population density, poor sanitation facilities, shortage of water supply, inadequate sanitation and hygiene services, and insufficient health awareness campaigns owing to the emergency, [13]. A study conducted in Ethiopia revealed a disparity in the use of communal and privately-owned toilets, allowing the assessment of improved and unimproved sanitation facilities [16].

In this study, 71.4% of respondents used clean restrooms, whereas 28.6 percent utilized dirty latrines, this is a high risk of diarrhea outbreaks. However, another study found that proper sanitation facilities such as clean latrines are key preventive approaches for diarrheal infections, and superior for reducing fecal-oral transmission, [15]. This study shows that households without toilets had a statistically significant difference in diarrhea, compared to those with latrines. According to a recent survey in North Ethiopia, 94% know the

importance of latrines for health, however, 48.3% believe latrines are primarily for the wealthy people [5].

This study revealed that the families who did not clean their latrines were more likely to have diarrhea than those who clean their toilets regularly. We observed sanitation facilities in each household to determine the sanitation status at the household level and 87.6% of households saw flies in the food preparation area, followed by 81.5% of households lacking access to handwashing facilities. Approximately, 83.4% cleaned their kitchen, swept, and tidied to avoid food contamination. This result is also lower than the findings of a similar study that presented 92% households cleaned their kitchen and swept, in Kersa Woreda, Eastern Ethiopia [17].

Moreover, 66.8% of respondents prioritized waste around their homes, but only 33.2% had adequately managed it. Comparing this study's findings to those from South Ethiopia, where only 18.5% of families had children managing solid waste, [16]. Concerning waste disposal, around 40.7% of participants declined to utilize it, while 24.1 percent dumped it in an open place. Also, 57.7% of participants collect trash outside their homes, causing diarrhea, whereas 42.3% correctly dispose of their waste. Furthermore, another research highlighted that 95.6% of households correctly disposed of waste, which can reduce diarrheal prevalence [8].

Conclusion

This study shows an association between sanitation practices and diarrhea in children under five years old in both IDP and host communities in the Hodan district. Those with diarrhea had been under 35 months, the results revealed poor sanitation facilities and those sanitation factors associated with diarrhea include open-pit latrines with no slabs, water treatment, government housing, hygiene status among children, and flies seen in the kitchens. The majority of people lived in overcrowded neighborhoods with a high number of IDP families, rendering them more vulnerable to parasites and diarrhea due to poor sanitation conditions. Each household needs adequate latrines, safe drinking water, a waste disposal system, and improved hygiene practices. Multiple-family buildings had less sanitary facilities than single-family apartments, which require appropriate WASH services.

Our study findings recommended raising awareness among children under 35 months in the Hodan district, providing adequate water, sanitation, and hygiene services, and promoting proper handwashing practices among caregivers, children, and residents of the Zona-K IDPs area and the host community at the study site. Establishment of health promotion sessions at the household level to educate caregivers and children under the age of five about the effects of diarrhea and the importance of the availability of adequate sanitary facilities is recommended. Also, we recommended

conducting further research on the association between diarrheal diseases and sanitation factors at the study site.

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