

Original Research Article

Assessing factors associated with FSM practices among residents living in Baidoa, Somalia

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ABSTRACT

Background: Excreta is a normal part of life, but if it is not appropriately controlled, it can lead to waterborne diseases, most low- and middle-income countries lack adequate FS treatment and management service coverage. The study's main goal was to assess fecal sludge management practices and associated factors among communities in Baidoa, Somalia.

Methods: The study adopted a cross-sectional study design. The collected data was analyzed using Statistical Software for Social Sciences (SPSS) version 21. Descriptive statistics and chi-square were used. Qualitative data was thematically analyzed.

Results: The study identified that 66% of the Baidoa FS produced is not well managed. Regarding community perceptions, about 75.80% of the study participants don't understand poor sanitation while 30.1% don't know the relationship between poor sanitation and health risk. Results showed a significant association between education level and access to latrines, (χ^2 (4, n=385) = 50.672, p<0.001). The findings revealed a statistically significant association between residential status and access to FSM services (χ^2 (23, n=385) = 148.82, p<0.001). HH monthly income is significant in access to FSM services (χ^2 (64, n=385) = 113.180, p<0.001); and limited capacity of Baidoa municipality.

Conclusions: There are gaps in FSM management and residents are at risk of health hazards/disease outbreaks. The key recommendation is the development of strategic sanitation service delivery planning in view of FSM service chain and formulation of regulations to govern FSM service provision by different actors to safeguard the health safety of living, learning, and working environments.

Keywords: Faecal sludge management, Sanitation, hygienic disposal, human fecal matter

INTRODUCTION

The World Health Organization (WHO) defines sanitation as "the establishment of facilities and services for the hygienic disposal and management of human fecal matter from the toilet to waste storage and treatment facilities or transportation, treatment, and subsequent safe end-use or landfilling".¹ Safely managed sanitation is vital for health, as it prevents infections and improves and maintains the mental and social well-being of people. In

contrast, the lack of a safely managed sanitation system leads to infections and disease outbreaks such as diarrhea and cholera.^{2,3}

Poor sanitation has been linked to preventable diseases that affect nearly 25% of children under the age of five including diarrhea and parasitic infections as well as environmental enteric instability.⁴ An estimated 280,000 individuals die every year because of diarrhea-related diseases which could be prevented with the provision of

safely managed sanitation infrastructure and services.² The prioritization of waste management amongst other Sustainable Development Goals (SDGs) under SDGs 11 and 12 advocates for a new approach that factors in imagination and innovation to mitigate the challenges associated with waste management. The United Nations further sets an ambitious target of achieving responsible production and consumption cycles anchored on targeted environmental waste management policies through the emphasis on measures such as reuse, recycling, reduction, and prevention.⁵ Sanitation remains one of the biggest challenges in the development of urban centers especially in emerging economies.

While a body of evidence suggests that countries in Africa are on the right trajectory in the implementation of sanitation and waste management practices to match their counterparts in other developed nations, limited progress can be observed in Sub-Saharan Africa, specifically Somalia.^{6,7} The fecal sludge management problem in Somalia is attributed to both social and institutional aspects such as lack of access to sanitation facilities and services and institutional and legal hurdles curtail efforts of improvement (Singh et al).

Despite the government's commitment to implement working structures to improve sanitation management, the institutions lack sufficient capacity, especially at the municipal level. Furthermore, the perception of the local residents is mixed in that the majority consider fecal sludge management not a priority compared to other pressing issues facing major towns.⁸ Despite these underlying challenges, towns such as Baidoa town, which is of the focal importance of this study, are expanding due to an unprecedented surge in population density raising the fears that the current waste management system might be overwhelmed in terms of supporting the residents' sanitation needs. According to on-site sanitation mechanisms are the most used approach to fecal sludge management in Africa despite the introduction of sanitation technologies.⁹ This study aimed to assess; the current faecal sludge management (FSM) practices among the communities living in Baidoa, the perceptions on fecal sludge management practices among the communities, the capacity of Baidoa municipality in the management of fecal sludge, and to determine socio-demographic factors influencing FSM practices.

METHODS

Study design

The study adopted a cross-sectional study design with a mixed method approach to data collection, both qualitative and quantitative data were collected to understand the factors associated with fecal sludge management practices among the communities. The quantitative method sought to understand the trends and patterns between the variables under investigation and

understand the underlying relationships between the FSM practice and socio-demographic factors.

Study area

This study was performed in Baidoa town with an approximate population of over 1,200,000 individuals of which 430,000 individuals are internally displaced persons (IDPs) as per Somalia camp coordination and camp management (CCCM) cluster.

Study population

The population being studied comprised all residents of Baidoa town which include host communities, internally displaced persons, returnees, and refugees who require effective fecal sludge management to achieve a healthy environment

Sample size determination

The Fisher et al sample size determination was adopted to recruit 384 study respondents into the study. For the qualitative aspect of the study, 10 Key informants were purposively sampled from private service providers and global non-profit organizations.

Sampling technique

The study employed cluster sampling methodology to recruit participants for the study, simple random sampling was finally utilized to select study respondents for this study from selected clusters.

Data collection tools and procedure

This study used the following quantitative data collection tools: structured household questionnaires and secondary statistical data from government archives. The study period was from September, 2021-2022. The household questionnaires were conducted using the KOBOLLECT tool. The study collected qualitative data through key informant interviews (KIIs) with professionals and service providers and focus group discussions (FGDs) with targeted members of society. Quantitative data collection involves gathering numerical information such as numbers of people, percentages, and averages. Qualitative data collection involves gathering non-numerical information that can't be measured or counted such as text, videos, and audio.

Statistical analysis

Quantitative data was analyzed using the statistical package for social sciences (SPSS) by applying descriptive statistics, and the Chi-square test of association. A significance level at 0.05 was set for the statistical analysis. Thematic analysis was used for qualitative data.

Ethical consideration

Mount Kenya university institutional ethics review committee and Baidoa municipality provided ethics approval to allow the collection of data from the focused inhabitants and experts in the field. Only those who gave their permission were interviewed. The research study stuck to the questions in the designed questionnaire and did not stray into topics that the questionnaire does not cover. Participation was entirely voluntary, with participants free to withdraw at any moment during the research process. Participants were not forced to take part in the study. Participants were asked to provide informed consent and had the option of participating or otherwise. Privacy and anonymity were ensured using a coding in which each participant has designated a special identifier (known only to the researcher/me) so that individual data collected is safe and cannot be tracked.

RESULTS

Response rate

A total of 386 participants were engaged to participate in the study; however, one participant declined to participate giving a response rate of 99.7%.

Current FSM practices

As indicated in Table 1 below, study findings revealed that 71.6% of the study participants' families in Baidoa town do have access to latrines/toilets. 65.9% of the assessed communities are using ventilated improved latrines. 71.6% of them do have access to communal latrines. 92.1% of families that do have access to latrines and were making use of latrines. Aim of constructing these FS containments is to prevent environmental pollution and public health hazards in Baidoa town.

Latrine filling and emptying

Regarding latrine filling and emptying, the majority (63.5%) of the study participants' families reported their latrines got filled up. 33.3% of the participants reported that they emptied the latrines into fully lined septic tanks with soak-away pits as per Table 2.

Latrine overflow and frequency of latrine filling up

The study participants reported that 63.7% of communities living in Baidoa town latrines got filled up in the last five years and this requires emptying, transportation, treatment, and safe disposal which as per FGDs participants and key informant interviews participants mentioned has serious gaps regarding emptying service providers, equipment, safe disposal site, and regulation. In addition, the cost of emptying latrines, and unhygienic handling of pit emptying are real challenges faced by the residents of Baidoa when their

facilities get filled up. However, 68.7% of the latrines were emptied and reused after it got filled.

FGDs and KIIs findings on FSM practices among communities living in Baidoa findings presented below.

Quoting KII 2,

“The city population is rapidly growing and with no urban infrastructure planning waste disposal sites are not planned for, drainage systems are either not available or not properly managed and liquid waste and human excreta is released to public drainage leading to water sources contamination.”

Latrine pit/septic tank emptying

As indicated in Table 4 below, 74.4% of the pit emptying in the assessed community emptied their pits by hand, using buckets or similar items. 94.3% of the study participants' families are paying for pit emptying services. While 81.3% of the study participants think the price of emptying latrines is too expensive.

The participants were asked to explain whether the capacity gaps at the containment stage of FSM meet the needs/demands and targets that protect public and environmental health. They noted that Baidoa has a huge internally displaced population with no access to adequate sanitation services, and thus open defecation is common. The population is growing at a rapid rate the available sanitation facility cannot meet increasing demand. Congestion in most of the city settlements to access the desludging sites is a capacity gap at the transportation stage of FSM. Further, group discussion participants noted that road access challenges affect the transport of sludge to existing containment points.

Quoting KII 7

“Baidoa lacks safe waste disposal sites- waste is either dumped within residential areas or disposed in the open, the impact is the contamination of water sources and environmental degradation, due to poor waste disposal and management trend causing disease outbreaks is common in Baidoa. The city population is rapidly growing and with no urban infrastructure planning waste disposal sites are not planned for, drainage systems are either not available or not properly managed and liquid waste and human excreta is released to public drainage leading to water source contamination”.

Community perception and knowledge on FSM

As indicated in table 5 below, 77.40% of the study participants understand that poor sanitation causes water contamination and 69.90% of the study participants understand that poor sanitation can cause health issues. However, 75.80% of the study participants do not understand that poor sanitation can cause harm to the

environment and 90.10% of the study participants do not understand that poor sanitation can increase the number of days lost at work and at school. 94.80% of the study participants do not understand poor sanitation can cause a reduction in life expectancy. This means that the majority of Baidoa town resident do not have good knowledge about the consequences of poor sanitation services in their community. There is a general lack of information and knowledge on the consequences of poor FSM.

FSM perceptions

On fecal sludge management perceptions, 64.3% of study participants rated their settlement as having either a bad or very bad FSM situation because there are not enough containment facilities, pit emptying service providers, transportation service providers, treatment systems put in place, bad smells coming from latrine pit/septic tank overflow, public health risks involved in manual pit emptying and safe disposal of FSM, 54% of study participants' families had no plans to improve fecal sludge management practices in their family, study of Endris in Kombolcha town, Ethiopia that revealed 51.7% of study participants' families had no plan to improve their sanitation, 46% of study participant have plans to improve their FSM practices and that is a good indication of improving overall FSM in Baidoa, 70.8% had no plans to improve their FSM practices because of financial constraints. Most IDPs, returnees, and refugees are using shared latrines built by humanitarian agencies to support vulnerable communities in Baidoa, there is no privacy, long queues, and dirt all time.

Table 6 below study findings indicated that biggest challenge to having a plan to improve their FSM practices was lack of capital to improve their sanitation facilities and this has direct relationship with family monthly income earlier discussed which majority of residents were getting less than 2 dollars day for a family of 6 members/more. Limited knowledge of how to do FSM improvement plans for their families was 2nd biggest challenge, others mentioned not having their own land to build new latrines/sanitation facilities, and the landowners are not willing to allow construction on their land.

Socio-demographic factors influencing FSM

As indicated in Table 7 below, the socio-demographic factors such as education level, study participants' community resident status, gender, and influencing FSM in Baidoa town were assessed and the results were presented. The proportion of households with access to latrines increases with higher levels of education. For example, among households with no formal education, only 53.6% have access to latrines, whereas, among households with post-secondary education, 100% have access to latrines.

Results showed statistically significant association between education level and access to latrines [$\chi^2(4, n=385)=503672, p<0.001$]. Results suggest that education level may be an important factor in determining access to latrines, and efforts to improve education may also improve access to sanitation facilities.

The chi-square test of independence shows that the study participants' community resident status was associated with FSM practices among local communities in Baidoa. findings show that host communities have a better capacity to build their own latrines compared to refugees and internally displaced communities. The results showed a statistically significant association between study participants' community resident status and access to FSM services, [$\chi^2(3)=148.82, p<0.001$].

Community FSM service delivery satisfaction in Baidoa town

As indicated in Table 8, analysis for level of satisfaction with sanitation services in households about the status of the household shows that the Pearson Chi-Square value was 567.677 and the $p=0.000$. This implies that there is a significant difference in the level of satisfaction with sanitation services in households in reference to status of the household (Host communities, internally displaced households, refugees, and returnees). The results showed a statistically significant association between study participants' community resident status and satisfaction with sanitation services, [$\chi^2(3)=148.82, p<0.001$]

Table 1: Fecal sludge containment facilities.

Variables		N	Percentage (%)
Household members access to latrines	No	109	28.4
	Yes	276	71.6
Kind of toilet/latrine facility	Automatic cistern flush	30	10.9
	Other	1	0.4
	Pit latrine with slab	33	12
	Pit latrine without slab/open pit	12	4.3
	Pour/manual flush	18	6.5
	Ventilated improved pit latrine	182	65.9
Access to community toilet	No	31	28.4
	Yes	78	71.6
Members of the household using the toilet/latrine	No	22	7.9
	Yes	254	92.1

Table 2: Filling up of latrines and where it empties into.

Variables		N	Percentages (%)
If this toilet empties to a pit or septic tank, has it ever filled up?	I don't know	11	3.9
	No	79	28.7
	Not applicable	10	3.6
	Yes	176	63.7
Toilet discharge	Directly to open drain / ditch	12	4.3
	Directly to open ground	2	0.7
	Directly to sea, lake, or river	2	0.7
	Fully lined pit	28	10.1
	Fully lined septic tank with overflow to drain/open ground/	58	21.0
	Fully lined septic tank with soak away	92	33.3
	Other	51	18.5
	Partially lined septic tank (bottom and/or sides unlined)	14	5.0
	Piped sewer system	5	1.8
Pit with unlined bottom or sides	12	4.3	

Table 3: Latrine overflow, frequency of latrine filling up and emptying by service providers.

Variables		N	Percentages (%)
What did you do when the pit or septic tank filled-up last time?	Abandoned and pit/tank unsealed	7	3.9
	Abandoned with sealed cover on pit/tank	14	7.9
	Covered and used alternative pit	32	18.2
	Emptied and reused pit/tank	121	68.7
	Others	2	1.1
Who is responsible for latrine emptying?	Formal provider (company / NGO)	15	5.4
	Formal provider (utility)	3	1.1
	Informal provider (individual)	103	37.3
	Member of household	82	29.7
	Neighbors	14	5.1
	Others	59	21.4

Table 4: Latrine pit/septic tank emptying.

Variables		N	Percentages (%)
How was it emptied?	By hand, using buckets or similar	61	74.4
	By hand, using manual pump	14	17.1
	Mechanically, using small machine	3	3.6
	Mechanically, using tanker truck	4	4.8
What was it emptied into?	Directly into drain / water body / field	152	55.1
	Directly into drum / open container	4	1.4
	Directly into machine / tanker	4	1.4
	Into a pit on the compound that is left open	11	4.0
	Into a pit on compound that is then covered	42	15.2
	Other	63	22.8
Did you pay for the pit to be emptied?	No	10	5.7
	Yes	166	94.3
Do you think the prices of pit emptying is fair price	About fair	11	6.7
	Quite cheap	20	12.0
	Too high	135	81.3

Table 5: Knowledge on risk caused by poor sanitation/FSM.

Knowledge on FSM problems	Response (%)	
	No	Yes
Contamination of water sources	22.6	77.40
Health issues	30.1	69.90

Continued.

Knowledge on FSM problems	Response (%)	
	No	Yes
Harm to the environment	75.80	24.20
Increased number of days lost at work and school	90.10	9.90
Reduction of life expectancy	94.80	5.20

Table 6: FSM perceptions.

Variables		N	Percentages (%)
How do you rate FSM in your settlement?	Very bad	117	30.3
	Bad	131	34
	Good	113	29.4
	Very good	24	6.3
Do you have any plan in improving FSM at your household level?	No	208	54
	Yes	177	46
If yes you have plan in improving FSM in at your household level, what made you start this plan?	Other	5	2.8
	Repugnance and smelly conditions of current facility	5	2.8
	The current one is not safe and improved enough	28	15.8
	To have own toilet instead of public/communal toilets	125	70.6
	To not be ashamed when we have visitors	14	7.9
If no, what is the biggest challenge to improving your sanitation arrangements in this way?	Don't know	6	2.8
	Lack of finance	143	68.8
	Lack of interest of other household members	4	2
	Lack of knowledge on how to do this	52	25
	Landlord does not want to invest option 5	2	1
	Other	1	0.4
What is your opinion about taking actions at the household level for fecal sludge related problems?	I am willing to take actions as much as I can	243	63.1
	I have other main concerns	23	5.9
	It's not a problem for me	14	3.6
	It's not my responsibility	80	20.7
	Other	25	6.5

Table 7: Show cross-tabulation of study participants' education and community resident status influences access to FSM services in Baidoa town.

Variables		Access to FSM services		Chi-square
		No	Yes	
Education level	No formal education	46.4% (71)	53.6% (82)	$\chi^2 (4)=50.67, p<0.001$
	Islamic education	24.0% (29)	76.0% (92)	
	Primary education	13.8% (9)	86.2% (56)	
	Secondary education	0	100.0% (24)	
	Post-secondary education	0	100.0% (22)	
Residence status	Host community	1.1% (2)	98.9% (178)	$\chi^2 (3)=148.82, p<0.001$
	Internally displaced	52.2% (70)	47.8% (64)	
	Refugee	70.8% (34)	29.2% (14)	
	Returnee	13.0% (3)	87.0% (20)	

Table 8: Community FSM service delivery satisfaction in Baidoa town.

Variables	Please rate your level of satisfaction on sanitation services in your household				Chi-square tests	Df	Asy. Sig (2-sided)
	Satisfied	Unsatisfied	Very satisfied	Very unsatisfied			
Status of study participants (community status)	0	0	0	0	567.677	16	0.000
Host communities	67	68	33	12			
Internally displaced household	6	65	0	63			
Refugee	9	18	2	19			
Returnee	14	4	3	2			

DISCUSSION

Regarding latrine pit/septic tank emptying, this study has similarities with a study conducted in Rwanda, which reveals that 95% of the population in Kigali uses onsite sanitation, with pit latrines accounting for 80% of the total.¹⁰ In Baidoa 100% of the population is using onsite sanitation facilities and 65.9% of them are using Ventilated improved pit latrines. Lack of access to latrines can also lead to social and cultural problems, particularly for women and girls who may feel unsafe using open spaces for defecation. From this study, most households reported using completely lined septic tanks with soak away for toilet effluent when the toilets are full. These findings were similar to those of a study carried out in Kigali, Rwanda.¹¹ The management of fecal sludge is dangerous and ineffective because there is no authorized safe waste disposal plant functioning in the city.

From this research Inadequate access to latrines and inadequate services to empty latrines are major challenges in the field of sanitation, this was in agreement with a study conducted in Nakuru County.¹² In many parts of the world, millions of people lack access to safe and adequate sanitation facilities, which can lead to serious public health and environmental problems. From this research, FSM was poor despite the construction of additional latrines and greater coverage. Additionally, the establishment of rules or regulations controlling FSM Safe disposal locations has not been successful in FSM. This was contrary to a study by.¹³ Safe and appropriate FSM by developing cities depends on several factors which include the following but are not limited: the technical capacity of the city management in terms of available area or space it has for FS collections, number of trained operators, number of trucks to collect fecal sludge and number of households to be served

Results showed a statistically significant association between education level and access to latrines this was concurrent with the findings.¹⁴ The findings suggest that education level may be an important factor in determining access to latrines, and efforts to improve education may also improve access to sanitation facilities. The results showed a statistically significant association between study participants' community resident status and access to FSM services. These findings were in agreement with two other studies where findings show that host communities have a better capacity to build their own latrines compared to refugees and internally displaced communities.^{9,15} Concerning FSM perceptions research indicates that flooding causes latrines to overflow. Furthermore, every rainy season floods damage a huge number of latrines noted that if there is no proper sanitation planning or clearly defined strategies to ensure proper fecal sludge management, pollution of the environment and water bodies from unsafe FS disposal is unavoidable.¹⁶ From this study, The results showed a statistically significant association between study participants' community resident status and satisfaction

with sanitation services. These findings were in agreement with a study done in South Africa.¹⁷

CONCLUSION

Community perception and knowledge on fecal sludge management in Baidoa town indicated that there is a lack of knowledge and misperception of the impact of poor FSM on our living, learning, and working environment. The study revealed that emotional motivators like owning latrines and being afraid to be ashamed by relatives and visitors played tricks on the community to have a plan to improve their sanitation facilities rather than the health risks aspect. There is a need for public sensitization on the health risks associated with poor FSM in Baidoa, Somalia. Socio-demographic factors such as study participants' community resident status, education level, number of years of residence, and household monthly income have a direct association with access to sanitation facilities. For example, host communities had more access to latrines than refugees, returnees, and IDPs, the higher the education level the higher access to sanitation services and household income also played a role in determining access to latrines and other FSM practices in Baidoa cities. The study findings established that Baidoa municipality has limited capacity to appropriately manage FSM in Baidoa town; There are no clear guidelines and regulations, and it can be difficult to ensure that FSM practices are being carried out safely and effectively. Additionally, inadequate government funding for sanitation infrastructure and services can hinder progress in improving FSM practices in Baidoa town.

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