



Effect of Household Solid Waste Management on Environmental Sanitation in Hargeisa, Somaliland

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Abstract: The study investigated the effects of households' solid waste management on environmental sanitation in Hargeisa Somaliland. In Somaliland especially Hargeisa city there is no comprehensive, centrally organized waste collection system. The study adopted a cross-sectional survey design on simple random sample of 377 of households. Data was collected using questionnaire. This study assessed waste collection, transportation and disposal used by the households in Hargeisa city. The study found that waste collection has a significant effect on environmental sanitation of households in Hargeisa city. χ^2 (N=341)=26.912, $p=.000$, $C=.270$. And Waste transportation of household's solid waste management have a significant effect on environmental sanitation of households in Hargeisa city. χ^2 (N=341)=43.654, $p=.000$, $C=.337$ and Waste disposal of household's solid waste management have a significant effect on environmental sanitation of households in Hargeisa city, χ^2 (N=341)=12.786, $p=.002$, $C=.190$. The study concludes that Poor household solid waste transportation has the most significant effect on environmental sanitation of households in Hargeisa city. This is because all other elements are statistically significant. Transportation arises for the largest value (33.7%) in effecting the environmental sanitation of households. The study recommends that local government and ministry of health and the district committee to develop environmental sanitation education programs concerning proper solid waste management at household level and distribute the household's waste collection and transportation containers with cover and also designate disposal sites for the city. The researcher recommends that further research should investigate in whole Somaliland regions, because diarrhea, asthma and pneumonia exist other regions which can be due to household's solid waste Management.

Keywords: Solid Waste management, Environmental Sanitation, Waste Collection, Waste Transportation, Waste Disposal, Hargeisa, Somaliland

1. Introduction

The problem of solid waste management (SWM) is a global concern and affects even the developed nations, in Europe and America, solid waste problem was first recognized in 18th century at the beginning of the industrial revolution [1]. The problem of waste management is more severe in Africa where it has become an increasingly difficult and complex problem as well as a major public health and environmental concern [2]. In Uganda, careless disposal of wastes block storm water drains causing floods and other health hazards and poor aesthetic [3]. In Somaliland, The accumulation of wastes, open dumping, defecating and urinating in open land, in and around human settlements and work areas, is very widespread, observed that when poorly managed, wastes easily become environmental and health hazard [4]. In Hargeisa city the effect of solid waste management on environmental

sanitation remain largely undefined.

A Household solid waste is made of everyday item which comprising of garbage and rubbish such as bottles, cans, clothing, compost, food packaging, food left-over, newspaper, magazines, and yard or storage trimmings that originates from private homes or apartments that have been used up or broken and are thrown out as waste [5]. Also Household's solid waste management are monitoring, collection, transport, processing, recycling and disposal [6]. In this study household solid waste management is defined to the process of collecting, transporting and disposal solid wastes. Household's solid waste management practices was characterized by solid waste collection, waste transportation, and waste disposal [7]. They are also referred as collecting, transportation, and disposing of solid material that is discarded because it has served its purpose or is no longer useful [8]. In this study household's solid waste management was operationalized

into collection, transportation and disposal.

Environmental sanitation defined as 'comprises the proper collection, transportation, disposal and treatment of human excreta, solid waste and waste water, control of disease vectors and provision of washing facilities for personal and domestic hygiene [9]. While also environmental sanitation is the sum total of activities embarked upon by people to promote healthy living conditions [10]. However, in this study, environmental sanitation is defined to activities aimed at improving or maintaining the standard of basic environmental conditions affecting the wellbeing of people.

Globally, an estimated 94% of the diarrhoeal diseases and Diseases with the largest absolute burden attributable to modifiable environmental factors included: diarrhoeal diseases; lower respiratory tract infections; 'other' unintentional injuries; and malaria, and associated with risk factors such as unsafe drinking-water and poor environmental sanitation and hygiene [11]. According to World Bank (2012), poor solid waste management in the developed countries is a major threat to public health and environmental quality, and reduces the quality of life, particularly for the poorer residents in both urban and rural areas [12]. Unpublished data recently collected from Hargeisa Group Hospital Intestinal and respiratory Health of Hargeisa is generally poor. In Hargeisa Group Hospital 10.5% cases of Diarrheal infections has been reported in 2018 and over 15% of respiratory disease cases 12% of them pneumonia, 11% of Asthma and this health problems have not been investigated. But the negative effects of household's solid waste on environmental sanitation of the population have been reported in several areas.

Contextually, household's solid wastes in Hargeisa are not collected regularly for various reasons. Transportation is minimally present if any since many households are not well organized or lack proper collection facilities as households solid wastes await collection by authorities. Household's solid wastes generated by most household are not disposed of in an organized manner in Hargeisa. Much of this may be attributed to few existing companies besides lack of concern by local authorities. The designated dumpsites are not well managed and households are unable to take their solid wastes as the site is far from majority of the Estates/Village across Hargeisa.

Proper solid waste management should lead to proper environmental sanitation, which is not the case in Hargeisa city. Households in Hargeisa city have generally no designated waste collection points. They also lack regular household's solid waste collection plans supported by either local authorities or collection companies. However there is a lack of knowledge on effect of household's solid waste management on environmental sanitation in Hargeisa city. This study was investigating effect of household's solid waste environmental sanitation in Hargeisa city.

2. Methodology

2.1. Study Design

This study was used cross-sectional survey research design;

the study was conducted at Hargeisa city, Somaliland. Hargeisa is the capital city of Somaliland and is located in the northern part of Somalia. Hargeisa is on latitude 9° .5624" and longitude, 44° .177" and 1,334 meters (4,377 feet) of above the sea level.

2.2. Sample Size Determination

The sample size for this study was 377 of households. The sample will determine according to Krejcie and Morgan tables of samples [13]. This table was preferred because, unlike other available tables like Yamane [14]. it allowed the researcher to choose between different levels of margins of error and confidence levels.

2.3. Sampling Procedure

The study employed by simple random sampling to select the sample. Further was get permission from the concerned households in Hargeisa town. Researcher was used questionnaire to collect data. Data was analysis using chi-square technique and report in tables and figures.

2.4. Data Collection Instruments

This study was used a semi-structured questionnaire method to gather the primary data from the issue under investigation. A semi-structured questionnaire is a blend of close-ended and free-response item in a single instrument.

2.5. Data Analysis

The study using percentages and chi-square test of independence. Percentage was used to describe, organize and report background information. Chi-square is a statistical technique used to compare differences between categorical frequencies and is used when data is categorical and drawn from a population with a uniform distribution in which all alternative responses are equally likely [15].

2.6. Ethical Consideration

All participants who participated in the study were made to understand the purpose of the study, verbally assured of confidentiality for their responses and that they should not write anything on the questionnaire that could reveal their identity.

3. Results and Findings

Sample size designed for this study was 377 but only 341 respondents returned complete questionnaires. This was 90.5% response- return-rate which was acceptable since it was more than the 70% return-rate recommended in several science researches.

3.1. Sociodemographic Characteristics of Respondents

3.1.1. Gender of Respondents

Respondents were asked to indicate their gender. The responses obtained are summarized in Figure 1.

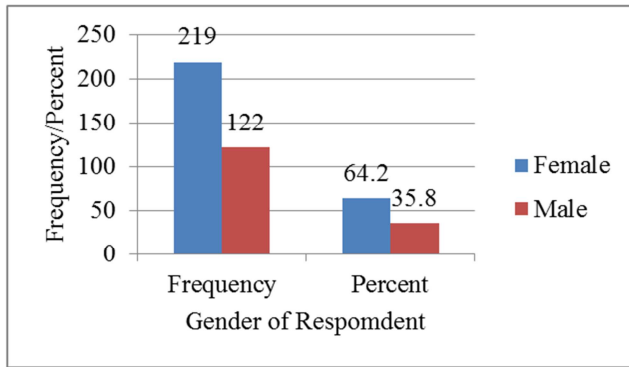


Figure 1. Gender of Respondents.

Figure 1 shows the distribution of respondents by gender. It shows that majority (64.2%) of the respondents were females while the remaining (35.8%) were males. This means that more females than males are involved in HSWM in Hargeisa, Somaliland.

3.1.2. Age of Respondent

Respondents were also asked to indicate their age and they responded as shown in Figure 2.

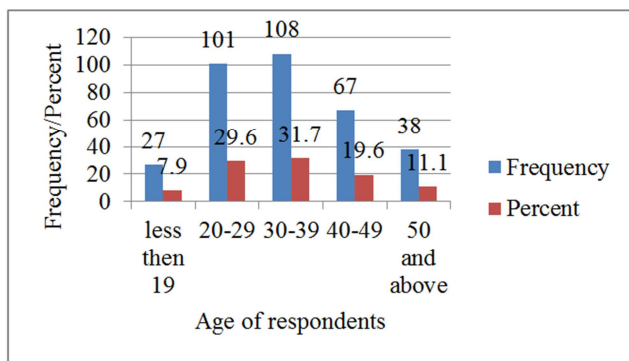


Figure 2. Age of Respondent.

Figure 2 shows the distribution of respondents by age. It shows that most (31.7%) of the respondents were aged in between 30-39 years and, 7.9% of the respondents were less than 19 years. The majority of respondents (60.0%) of respondents were aged between 20- 39 years.

This indicates that most of the respondents were mature people who were able to provide valid information for this

research.

3.2. Households Solid Waste Management and Environmental Sanitation

3.2.1. Measurement of Variables

After describing the demographic factors of respondents, the researcher proceeded to determine effects of households' solid waste management methods on environmental sanitation in Hargeisa.

The study followed three specific objectives based on these themes: to determine the effect of waste collection, transportation and disposal of household's waste solid Management on environmental sanitation in Hargeisa, city. Waste collection was operationalized as metal container and plastic bags; transportation as garbage trucks, dumper placer and animal carts; and waste disposal as open dumping, burning and dumping into dry river.

Respondents reacted to several statements on each of the sub-variables. The responses were scored from 1-3 depending on the item. The scores from sub-variables were added to obtain the overall score on the variable. The minimum and maximum scores depended on number of sub variables on each major variable.

The respondents provided information on several statements on these variables intended to assess the status of each subsidiary variable. Responses were scored and the score on each variable was obtained from the sum total of all scores on items under the variable.

The scores on collection type ranged from 5-18 and were rated such that scores of 5-9 were rated poor and coded as 1, scores of 10-13 were rated as moderate and coded 2, scores of 14-18 and coded 3. The scores in transportation type ranged from 4-17 and were rated such that score 4-8 were rated poor and coded 1, scores of 9-12 and rated moderate and coded 2, scores of 13-17 and coded 3. The scores on ways of disposal ranged from 5-18 and were rated

from such that scores of 5-9 were rated poor and coded 1, scores of 10-13 and were rated moderate and coded as 2, scores of 14-18 /were rated good and coded 3. Environmental sanitation on focus on Current situation environmental sanitation ranged from 4-16 and were rated such that scores of 4-9 were rated have uncleaned and coded 1, scores of 10-16 and were rated clean and coded 2.

Table 1. Measurement of variables.

Variable	Indicators	Score	Code	Status	Scale	Analysis Methods
Waste Collection	-Metal containers.	5-9	1	Poor	Interval	Chi square of independency
	-Plastic Container	10-13	2	Moderate		
	-Polythene bag.	14-18	3	Good		
Waste Transportation	Trucks	4-8	1	Poor	Interval	Chi square of independency
	Vehicles	9-12	2	Moderate		
	Animal	13-17	3	Good		
Waste Disposal	Landfills	5-9	1	Poor	Interval	Chi square of independency
	Open dumping.	10-13	2	Moderate		
	Incineration.	14-18	3	Good		
Environmental sanitation		4-9	1	Unclean	Interval	Chi square of independency
		10-16	2	Clean		

3.2.2. Waste Collection and Environmental Sanitation

The first objective of this study was to determine effects of waste collection on environmental sanitation status of households in 26 June sub district. Collection was operationalized as type of metal container, plastic bags and polyethylene bags. Respondents were asked to react to several statements on these variables intended to gauge the type of waste collection. The responses were scored and converted in to 1 to 3 scales of poor to good as described in Table 1. Waste collection with current environmental sanitation of households was (42.2%) of respondents regard waste collection moderate, while (37.8%) of the households used poor waste collection and

19.9% of the surveyed have used good collection. The majority (54.3%) of households their current environmental sanitation status was unclean. While only 45.7% of households their current environmental sanitation status were clean.

The data in was tested using chi-square test of independence, under the null hypothesis that.

There is no significant difference in the current environmental sanitation status among households with different ways of households' solid waste collection.

$H_{01}: F_{o_{CN+ES}} = F_{e_{CN+ES}}$, where CN is collection and environmental sanitation.

Table 2. Summary of χ^2 Statistics of Collection with environmental sanitation.

Variable	N	Df	χ^2	Sig.	C	Decision Reject H_{01}
Collection*Environmental Sanitation	341	2	26.912	.000	.270	

Note. 1 cells (0.0%) have expected count less than 5. The minimum expected count is 31.11. χ^2 (.05, 2)=5.99.

Table 2 shows the results of chi-square test of independence of type of collection used for households' with current unclean and clean environmental sanitation status of households. It shows that χ^2 (N=341)=26.912, p =.000. This led to rejection of the null hypothesis. The study therefore established that collection have a significant effect on the current environmental sanitation of households.

The contingency coefficient (C =.270) indicates an association of 27.0% that collection effect the current environmental sanitation status of households. Therefore collection accounts for 27.0% of the variances in the environmental sanitation. Other factors remaining content.

3.2.3. Waste Transportation and Environmental Sanitation

The second objective of this study was to determine effects of waste transportation on environmental sanitation status of households in Hargeisa. Waste Transportation with current environmental sanitation of households was (40.8%) of households regard waste transportation was good, while (20.8%) of the households used poor waste transpiration.

The data was tested using chi-square test of independence, under the null hypothesis that.

There is no significant difference in the current environmental sanitation status among households with different ways of households' solid waste transportation.

$H_{02}: F_{o_{TP+ES}} = F_{e_{TP+ES}}$, where TP is transportation and environmental sanitation.

Table 3 shows the results of chi-square test of independence of waste transportation used for households' solid waste management at household level with current unclean and clean environmental sanitation status of households. It shows that χ^2 (N=341)=43.654, p =.000. This led to rejection of the null hypothesis. The study therefore established that transportation have a significant effect on the current environmental sanitation of households. The contingency coefficient (C =.337) indicates an association of 33.7% that transportation effect the current environmental sanitation status of households. Therefore transportation accounts for 33.7% of the variances in the environmental sanitation.

Table 3. Summary of χ^2 Statistics of Transportation with environmental sanitation.

Variable	N	Df	χ^2	Sig.	C	Decision
Transportation*Environmental Sanitation	341	2	43.654	.000	.337	Reject H_{02}

Note. 1 cells (0.0%) have expected count less than 5. The minimum expected count is 32.48. χ^2 (.05, 2)=5.99.

3.2.4. Waste Disposal and Environmental Sanitation

The third objective of this study was to determine effects of waste disposal on environmental sanitation status of households in Hargeisa. Type of waste disposal with current environmental sanitation of households was (37.2%) of households regard waste disposal was good, while (27.0%) of the households used poor waste disposal.

The data in Table 3 was tested using chi-square test of independence, under the null hypothesis that.

There is no significant difference in the current environmental sanitation status among households with different ways of households' solid waste disposal.

$H_{03}: F_{o_{DS+ES}} = F_{e_{DS+ES}}$, where DS is disposal and environmental sanitation.

Table 4. Summary of χ^2 Statistics of Disposal with Environmental Sanitation.

Variable	N	Df	χ^2	Sig.	C	Decision
Disposal*Environmental Sanitation	341	2	12.786	.002	.190	Reject H_{03}

Note. 1 cells (0.0%) have expected count less than 5. The minimum expected count is 42.09. χ^2 (.05, 2)=5.99.

Table 4 shows the results of chi-square test of independence of waste disposal used for households' solid waste management at household level with current unclean and clean environmental sanitation status of households. It shows that χ^2 (N=341)=12.786, $p=.002$. This led to rejection of the null hypothesis.

The study therefore established that waste disposal have a significant effect on the environmental sanitation of households. The contingency coefficient ($C=.190$) indicates an association of 19.0% that disposal effect the current environmental sanitation status of households. Therefore disposal accounts for 19.0% of the variances in the environmental sanitation. Other factors remaining content.

3.3. Findings

The study, therefore established that:

1. Waste collection of household's solid waste management has a significant effect on environmental sanitation of households in Hargeisa City. χ^2 (N=341)=26.912, $p=.000$, $C=.270$.
2. Waste transportations of household's solid waste management have a significant effect on environmental sanitation of households in Hargeisa city. χ^2 (N=341)=43.654, $p=.000$, $C=.337$.
3. Waste disposal of household's solid waste management have a significant effect on environmental sanitation of households in Hargeisa city. χ^2 (N=341)=12.786, $p=.002$, $C=.190$.

4. Conclusion and Recommendations

4.1. Conclusion

This study sought to determine the effect of households' solid waste management on environmental sanitation of households in Hargeisa, Somaliland. Based on the findings above, the researcher made the following conclusions as per the respective objectives;

Furthermore, the first objective; the researcher concluded that there is significant effect of waste collection on environmental sanitation of households in Hargeisa, Somaliland.

In relation to the second objective, the researcher concluded that the waste transportation has significantly affected environmental sanitation.

Lastly, the last objective, waste disposal has a significant effect on environmental sanitation of households in Hargeisa, Somaliland.

4.2. Recommendations

The study investigated effect of household's solid waste management on environmental sanitation of households in, Hargeisa city. The study recommends that local government and ministry of health and the district committee to develop environmental sanitation education programs concerning proper solid waste management at household level and

distribute the household's waste collection and transportation containers with cover and also designate disposal sites for the city. The researcher recommends also that further research should investigate in whole Somaliland cities, because poor environmental sanitation exist other regions which can be due to households solid waste management.

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