

An Assessment of How Various Types of Solid Wastes Affect Their Management in Laini Saba Location, Kibra Sub-County, Nairobi County, Kenya

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Abstract: This study is on solid waste management in informal settlements in Kenya, with specific focus on Laini Saba Location, Nairobi County. This study was carried out in Laini Saba Location, Kibra Sub-County, Nairobi County, Kenya, between September and October 2015. It contends that solid waste management is a challenge for cities' authorities in low-income countries mainly due to the increasing generation of waste and the burden posed on the municipal budget as a result of the high costs associated with its management.

The study found out that solid waste management in Laini Saba Location is not comprehensively done, though majority of the respondents at 56% indicated that they understood solid waste to be used items, unwanted items 15.6%; dirty materials 13.1%; used items, unwanted items and dirty materials at 7.3%. Most of the waste generated revolved around food leftovers, cartons, paper, rags, metals, plastic, polythene, glass, wood, ash, electronic waste at 16.4%. The respondents each generated between 6-10 litre buckets of solid waste at 38.6%, 3-5 litre buckets at 33.4%, 1-2 litre buckets at 16.1%, 16-20 litre buckets at 8.1%, and over 20 litre buckets at 5.2%. Eighty-six percent (86%) of the respondents said that they did not separate their solid waste, whereas 14% said that they separated them. The distance between the solid waste dumpsites and the nearest water sources was generally between 5 and 15 metres, posing great health challenges to the population. Finally, the study conducted a logistic regression analysis to determine the odds of occurrence of the variables of interests against exposure to certain variables. The study found out that there was significant relationship between age and health, and sex and contact with hazardous waste. The Odds Ratios (ORs) were 0.587 and 0.967. This means that exposure associated with health and hazardous waste has lower odds of outcome because $OR < 1$.

Keywords: environmental pollution, municipal solid waste, solid waste, solid waste management.

1. INTRODUCTION

Low-income countries face challenges in properly handling the volume of wastes produced in the cities while the residents are not equipped with the appropriate knowledge on solid waste management therefore; it is a growing environmental and financial problem.⁽¹⁾ When solid waste is not discarded properly it can have far-reaching consequences for the environment and its natural vegetation and inhabitants, as well as for public health.⁽²⁾ These wastes which are littered around in huge unsorted quantities eventually find their way in nearby streams and rivers which subsequently become polluted.⁽³⁾ Decaying wastes result in urban areas becoming unhealthy, dirty and unsightly places to reside in. It also reduces land use for other, more useful purposes.⁽⁴⁾

The cost of solid waste management is projected to soar to \$375 billion a year from the current \$205 billion as the living standards rise and urban population increases. Municipalities in developing countries spend 20-50 percent of their available recurrent budget on solid waste management, yet it is common that 30-60 percent of all the urban solid waste in developing countries is uncollected and less than 50 percent of the population is served.⁽⁵⁾

However, poor solid waste collection and disposal is a threat to public health and reduces the quality of life for urban residents especially in unplanned settlements. Kibra is one of the typical examples of such settlements. The County Government of Nairobi has failed to solve the problem of solid waste management in Kibra as evidenced by sight of heaps of un-collected waste strewn all over the settlement; hence it is heavily polluted by human waste, garbage, soot, dust, and other wastes. Therefore, the lack of sanitation combined with poor nutrition among residents' accounts for many illnesses and diseases.⁽⁶⁾

2. METHODOLOGY

The study area was Laini Saba Location, Kibra, Langata Sub-County in the County Government of Nairobi. Kibra as a whole is an informal settlement comprising of 13 villages covering approximately 2.5 square kilometers (Km²) with an estimated population of about 500,000 people giving an average population density of 2000 people per hectare although some villages are more crowded than others⁽⁷⁾ Laini-Saba is situated in Nairobi's southwestern Peri-urban zone approximately seven kilometers from the city center.

Most houses are wooden with a mud floor and corrugated iron sheet. Most people living in Kibra have little or no access to basic necessities, such as electricity, clean water, toilet facility and sewage disposal. Diseases such as malaria, cholera, and typhoid afflict large proportions of Kibra residents, due to lack of sanitation facilities. The number of households in Laini Saba location is 5,749. The area is occupied by people from different ethnic groups. The residents work in construction sites, business, civil service and private sectors. The sources of water in the area are tapped water and Mbagathi River⁽⁶⁾

This was a descriptive, cross sectional study conducted to determine solid management among residents of Laini Saba Location, Kibra, Nairobi County. A list of households was obtained from Langata Sub-county Statistical Office. Simple random sampling was used to select the first household in each village. List of households in the sampling frame were drawn to estimate regular interval of respondents. Moving clockwise, a sample interval of every 5th household was continued to reach the subsequent households until the sample was achieved. The researcher interviewed the household heads or any person above 18 years found in the house during the exercise. Where there was none of the persons above 18 years old, the researcher moved to the next house to continue with the interviews and recall visit was made later when the respondent was available.

Households in four villages were mapped with the number of households per village ranging from 1,020 in Soweto East village to 1,925 in Laini Saba village and a total of 5,749 households. The study adopted Fisher's formula for descriptive studies to calculate the sample size (1998).⁽⁸⁾

The completed questionnaires were checked daily for accuracy and completeness. Quantitative data from the field were coded, entered, and analyzed in Statistical Package for the Social Sciences (SPSS) version 20. Descriptive statistics were used to summarize categorical variables, whereas inferential statistics, particularly logistic regression, was applied to test the relationship between the variables. Odds ratios are used to compare the relative odds of the occurrence of the outcome of interest (health, hazard, and benefits), given exposure to the variable of interest (age, gender, education, occupation). The odds ratio is used to determine whether a particular exposure is a risk factor for a particular outcome, and to compare the magnitude of various risk factors for that outcome. OR=1 Exposure does not affect odds of outcome, OR>1 Exposure associated with higher odds of outcome, OR<1 Exposure associated with lower odds of outcome.

3. FINDINGS

There were five villages in total: Mashimoni, Silanga, Laini Saba, Soweto East and Kichinjio. There were more respondents from Laini Saba at 33.3% percent, followed by Mashimoni 27.8%, Silanga 20.8%, Soweto East 17.6%, and Kichinjio at 0.5%. Kichinjio was not part of the initial sample but because of simple random sampling, a few respondents from that village were interviewed.

Most families in did not have more than 10 children. Most families had 3 children had 20.4%, followed by 4 children at 19.8%, 2 children at 17.5%, 1 child at 16%, 5 children at 7.7%, 6 children at 5.7 percent. A negligible percentage had 9, 8 and 10 children at 0.8%, 0.5%, and 0.3% respectively. However, a significant percent of 11.3% of the respondents did not indicate the number of children they had. In addition, there were more female than male respondents at 53.4% against the male respondent at 46.6%.

The ages of the respondents varied, with the largest percentage (56.0%) between 25-30 years, followed by 18-24 years at 19.2%, 31-35 years at 9.7%. There were fewer respondents between 56-60 and 61-65 years at 0.3%. In essence the youngest respondent was 18 years whereas the oldest was 65 years.

A large percentage of the respondents were Christian at 85.4%, followed by Islam at 11.9%, traditional religion at 2.4% and other religions at 0.3%.

Seventy-one point nine percent (71.9%) of the respondents were married, followed by single ones at 19.5%, divorced at 6.4% and the widowed at 2.2%.

Almost all of the respondents were literate to some level of degree, with 67% of them possessing at least secondary school education qualifications, 19% college education, 11.2% primary education and 2% adult education qualifications. However, a paltry 0.8% of them did not possess any educational qualifications.

Fifty-five point seven percent (55.7%) of the respondents were employed, 40.2% were running businesses, 3.8% were doing other activities, whereas 0.3% were in business and formal employment.

Majority of the respondents at 56% indicated that they understood solid waste to be used items, unwanted items 15.6%; dirty materials 13.3%; used items, unwanted items and dirty materials at 7.3%.

Table 1: What is solid waste?

Definition of Solid Waste	Frequency	Percentage
Used items	215	56.0
Dirty materials	51	13.3
Unwanted items	60	15.6
Others	1	0.3
Dirty materials and unwanted items	15	3.9
Used items, dirty materials, and unwanted items	28	7.3
Used items, and dirty materials	14	3.6
Total	384	100

Nearly all (95.9%) of the respondents observed that there were benefits accrued from proper waste disposal, with only 4.1% of the disagreeing. With respect to the specific benefits from proper solid waste management, 58.8% of the respondents said that it prevented environmental pollution, prevention of diseases 16.9%, prevention of diseases and environmental pollution 10.5%. The rest of the respondents indicated a combination of all of the benefits.

Table 2: Benefits of proper disposal of waste

Benefit	Frequency	Percentage
Prevention of diseases	63	16.9
Prevention of environmental pollution	219	58.8
Creation of employment	8	2.2
Prevention of environmental pollution, creation of employment	11	3.0
Prevention of environmental pollution, creation of employment, others	3	0.8
Prevention of diseases, environmental pollution, creation of employment	23	6.2
Prevention of diseases, creation of employment	5	1.3
Prevention of diseases, prevention of environmental pollution	39	10.5
Prevention of diseases, prevention of environmental pollution, others	1	0.3
Total	372	100

Forty-three point four percent (43.4%) of the respondents observed that safe storage is the best way to manage solid waste, 26.9% recycling of waste, 12.4% recycling and safe storage of waste, 9.5% burning of waste. Others indicated composting, burying and managing in other ways at 1.6%, 1.6% and 0.3% respectively.

Table 3: How to manage solid wastes

How to manage solid waste	Frequency	Percentage
Recycling	102	26.9
Safe storage	164	43.4
Burning	36	9.5
Composting	6	1.6
Burying	6	1.6
Others	1	0.3
Recycling and safe storage	47	12.4
Recycling and burning	7	1.9
Recycling, safe storage and burning	2	0.5
Recycling, safe storage and composting	5	1.3
Safe storage, burning	1	0.3
Safe storage, burying	1	0.3
Total	378	100

On health problems associated with solid waste management, 13.1% of the respondents said diarrheal diseases, 12.6% respiratory diseases, 8.1% odors/ smell, 6.3% diarrheal, respiratory diseases, cuts, odors/ smell. The rest of the respondents (59.9%) indicated a combination of all of the health problems. Majority of the respondents got information on solid waste management from the health workers at 41.4%, local council 21.2%, media 18.4%, combination of health workers and local council 17.2%.

Most of the waste generated revolved around food leftovers, cartons, paper, rags, metals, plastic, polythene, glass, wood, ash, electronic waste at 16.4%. The respondents each generated about 10 litre bucket of solid waste at 38.8%, 5 litre bucket at 33.6%, 2 litre bucket at 16.2%, 20 litre at 6.1%, and others at 5.2%.

Eighty-six percent (86%) of the respondents said that they do not separate their solid waste, whereas 14% said that they separate them. With respect to number of areas or containers used by the respondents to separate solid waste, the valid percentages were that 69.4% indicated two areas or containers, 20.8% indicated other number of areas or containers, whereas 9.7% three areas or containers; whereas when considered with the missing values (81.4%) indicated, 12.9% indicated two areas or containers, 3.9% indicated other number of areas or containers, whereas 1.8% three areas or containers.

A majority (60.3%) of the respondents said that they had not come into contact with any hazardous waste, whereas 39.7% have encountered hazardous waste. On the precautions taken when in contact with hazardous waste, 47% of the respondents said that they wore gloves, gloves and safety boots, 19.2%, safety boots 13.2%, others 9.3%, masks 5.3%, and a combination of gloves, masks, and safety boots at 4%.

Table 4: Precautions taken when in contact with hazardous waste

Precaution Taken	Frequency	Percentage
Gloves	71	47.0
Masks	8	5.3
Safety boots	20	13.2
Overalls	3	2.0
Others	14	9.3
Gloves and safety boots	29	19.2
Gloves, masks, safety boots, overalls	6	4.0
Total	151	100

Plastic bags (79.7%) are widely used to store waste generated, followed by metal bins 9%, cartons 6.6%, and other methods of storage at 0.3%.

Fifty four point four percent (54.4%) of the respondents indicated that they re-used some of their generated solid waste, with 45.6% disagreeing. Majority (69.7%) of the respondents said that they did not compost their generated solid waste, whereas 30.3% compost them. In addition, most of the solid wastes generated are sold with metal, plastic and paper dominating the list at 14.8%. Nobody collects and disposes solid waste generated by the respondents according to 68.3% of the respondents, whereas 31.7% of the respondents disagreed. There was littering of vacant land according to 93.9% of the respondents. Six point one percent (6.1%) of the respondents did not observe littering of the environment. Ninety-five percent (95%) of the respondents experienced blocked drainage, whereas 5% did not. In a signal to health risks, majority (27.2%) of the respondents said that water sources were barely 6-10 metres from the solid waste dumpsites, followed by 1-5 metres at 25.8%.

Ninety-six point six (96.5%) percent of the respondents observed the presence of rodents and other vermin in solid wastes, whereas 3.5% did not. In addition, plastic bags were widely used to dispose wastes according to 96.6% of the respondents, whereas 3.4% of the respondents disagreed.

Finally, on the relationship between the variables, the study conducted a logistic regression analysis to determine the odds of occurrence of the variables of interests against exposure to certain variables. The study found out that there was significant relationship between age and health, and sex and contact with hazardous waste. The Odds Ratios were 0.587 and 0.967 respectively as in the tables below. This means that exposure associated with health and hazardous waste has lower odds of outcome because $OR < 1$.

4. CONCLUSION

The study concludes that solid waste management in Laini Saba Location is not comprehensively done, though majority of the respondents at 56% indicated that they understood solid waste to be used items, unwanted items 15.6%; dirty materials 13.3%; used items, unwanted items and dirty materials at 7.3%. Most of the waste generated revolved around food leftovers, cartons, paper, rags, metals, plastic, polythene, glass, wood, ash, electronic waste at 16.4%. The respondents each generated about 6-10 litre bucket of solid waste at 38.8%, 3-5 litre bucket at 33.6%, 1-2 litre bucket at 16.2%, 11-20 litre bucket at 6.1% and more than 20 litre bucket at 5.2%.

Eighty-six percent (86%) of the respondents said that they did not separate their solid waste, whereas 14% said that they separated them. This corroborates the hazardous impact that the solid waste could have on the residents. For instance, the distance between the solid waste dumpsites and the nearing water sources was generally between 5 and 15 metres, posing great health challenges to the population.

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