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Nexus International University ISSN: *3007-1682;* 11(2): 17-26

Household Solid Waste Management Practices in Low-Income Suburbs in Kaduna North and South Local Government Areas of Kaduna State, Nigeria

AKPOKOS JAMES AMOS, SILAS ANTHONIA BADUKU,
MAL. AHMED UMAR
Kaduna State University, Kaduna, Nigeria

Abstract. The recent surge in the volume of household solid waste generation especially in Sub-Saharan Africa has become a major public health concern as it poses severe health, safety and environmental consequences to the public. Given these concerns, this study investigated household solid waste disposal or management practices among residents of low-income suburbs in Kaduna metropolitan area. Questionnaire survey was used to elicit the required information from 450 household heads, selected from six (6) low-income suburbs in the study, using the systematic sampling technique. Descriptive statistics such as frequency distribution and percentages as well as chi-square test were employed for data analysis. The findings showed that food scrap is mentioned as the most generated waste by 65.1% of the respondents. This is followed by products packaging (63.8%) and rubber/plastic or polythene (55.3%). The study also showed that 47.2% of the respondents disclosed that they generate less than 1kg of waste daily and that household waste according to 59.5% and 26.0% are disposed mainly at open refuse dumps and by way of burning respectively. Additionally, 48.8% of the respondents stated that household heads/tenants are solely responsible for disposing their accumulated waste. This study recommends that practical skills on how food debris can be converted to manure or compost should be taught to residents and a system of waste collection which will utilize the services of private waste collectors and individuals should be put in place by the communities and other relevant stakeholders.

Keywords: Household, Low-income, Management, Neighbourhoods, Practices

1. Introduction

Household solid waste management is conceived in this study as all activities which involves the collection, transportation, processing, recycling and management of waste generated by human activities in residential settings which is eventually disposed in such a way that it does not become harmful on public health, conservation, aesthetics and other environmental consideration (Leblanc,2017; Fakere,2012). Recently, there has been a rapid increase in the volume of household waste generated globally (Tiseo,2023). The United Nation Environment Programme (UNEP) reported that an estimated 20 billion tonnes of solid trash were produced globally.

Similarly, a significant growth in solid waste generation has been reported in Sub-Saharan Africa countries in the last couple of decades. Adedara, Taiwo and Bork (2023) noted that the annual volume of waste produced in the African continent increased from 81 million tonnes to 174 tonnes per year between 2012 and 2016 and it is projected to reach 269 tonnes in 2030. In Nigeria, it is estimated that Nigeria generates 32 million metric tonnes of solid waste annually, with only 20-30 percent being collected, manage and correctly disposed (Babatunde, 2023; Udensi, Anyanwu, Opara, Duru, Onyema, & Okafor, (2023). Of this volume of waste generated in the country, about 85.8 percent is produced by households.

The surge in solid waste generation which is attributed to rapid population growth, urbanization, industrialization, poverty and economic development (Ezeah & Roberts, 2012 & Salisu, & Fashina, (2022) has created severe health, safety and environmental consequences especially in Sub-Saharan countries. The improper management of solid waste in many

African countries including Nigeria has provided breeding ground for the proliferation of disease vectors such as rats, flies and mosquitoes which spread diseases such cholera, malaria, typhoid fever, respiratory problems and cancers and also contributes to global climate change through methane, carbon dioxide generation (Wilson & Webster,2018).

To address these environmental and health challenges posed by indiscriminate waste disposal practices, the Federal government of Nigeria enacted and implemented series of legislations such as the national environmental (sanitation and waste control) regulations of 2009 and the national policy on solid waste management in 2020 in an attempt to address the increasing problem of waste management nationwide. However, Iheukwumere, Nkwocha, Nwabudike (2020) noted that the measures taken by government to regulate the indiscriminate disposal of waste has not yielded the desired objective as waste generation in Nigeria has consistently continue to expand both in volume and complexity despite the measures taken by government and its agencies. Solomon, (2009) attributed this failure to the huge land area that needs to be covered, large population of the cities, bureaucratic bottle necks associated with implementation of the policies as well as the capital-intensive nature of waste management.

Given the persistent health and environmental challenges associated with improper solid waste management in Nigeria, the need arises to understand how household solid wastes is generated, managed and disposed of by especially residents in the low-income suburbs or neighbourhoods in Kaduna metropolitan area. Consequently, therefore the overriding objective of these study is to determine household solid waste management practices among residents of low-income neighbourhoods in Kaduna North and South LGAs. It is expected that the findings of this study will help in the formulation of policies that will motivate individuals and communities to cultivate and adopt proper waste disposal or management practices.

2. Methodology

Location of Study: The study was conducted in Kaduna-North and Kaduna-South Local Government areas. These LGAs, in addition to some parts of Chikun and Igabi LGAs constitutes Kaduna metropolis, the capital of Kaduna state. The study area is largely cosmopolitan in nature consisting of people from different ethno-religious groups within and outside the state. The prominent ethnic groups in the area include the Gbagi, Hausa, Fulani, Bajju, Kagoro, Ham, Adara Kanuri and migrants from other states across Nigeria like the Yorubas, Igbos, Nupes, Tivs, Igala, Edos, etc. The choice of this area of study is informed by the considerable increase in the amount of solid waste generated by the increasing population and households.

Population of Study: The population of study comprised of residents of the low-income neighborhoods or suburbs located within Kaduna North and South LGAs. They include people from different ethno-religious background whom are residents of low-income suburbs within the Kaduna metropolitan area for a period of not less than one year. They also consisted of both male and female household heads engaged in different occupations irrespective of their educational status.

Sampling Technique and Sample Size: The first step in the sample selection process began with the compilation of the names of low-income communities or suburbs particularly those with the most open waste dump sites in each of the two selected LGAs. From the list compiled the researcher selected three (3) suburbs or neighborhoods in each of the two LGAs using simple random sampling technique. From Kaduna-North LGA, Anguwar-Shannu, Kurmin-Mashi and Tudun-wada were selected, while Makera, Badiko, and Badawa were chosen from Kaduna South LGA. Overall, a total of six (6) suburbs or neighborhoods from the study area were chosen for the study.
Given that the houses in each of the six (6) suburbs or neighborhoods selected for the study were systematically arranged on both sides of well laid out streets or pathways, the researcher started the selection by picking the first household on each side of the street, after which three (3) to five (5) households depending on the length of the street were are skipped and then the next fourth, fifth or sixth house as the case may be was selected. This method was used until the required seventy-five (75) households were selected in each suburb or community.

In each of the household picked, any adult person above the age of 18 years, irrespective of gender, whom was found at home during the survey was interviewed or given the research questionnaire complete by himself. Using Krejcie and Morgan's formula, the minimum sample size required for the study was found to be three hundred and eighty-five (385). To enhance the precision and provide more insights to our findings a total of four hundred and fifty (450) respondents were selected for the study. This implies that an equal number of seventy-five (75)

respondents were selected from each of the six chosen neighborhoods in the study area.

Methods of Data Collection: Questionnaire survey was the method primarily employed for data collection in this study. A total of four-hundred and fifty (450) questionnaires were administered to the respondents in their respective households. Literate respondents who could read and write were given the questionnaires to fill by themselves but were closely supervised by the researcher or his research assistants. Those who could not read and write, the researcher or his assistants read out the questions to them and their responses were recorded in the appropriate spaces provided in the questionnaire.

Method of Data Analysis: The quantitative data generated from the questionnaire survey was first checked for consistency and edited accordingly. After cleaning, the data were coded and analyzed using the Statistical Package for Social Science [SPSS] version 27.0. Descriptive statistics such as the use frequencies and percentages as well as chi-square test were employed for data analysis.

3. Findings and Discussions

Socio-demographic Characteristics of Respondents

A total of four-hundred and fifty (450) questionnaires were administered however only four-hundred and forty-seven (447) of the questionnaires were retrieved. The socio-demographic characteristic of respondents displayed in Table 1, shows that those who were below 21years were 17.4%. Respondents who were between 21 and 30years were 24.2% while 28.6% were between 31 and 40years and 18.6% were between 41 and 50years. Only 11.2% of the respondents were above 50years. The mean age of the respondents was 32.7years with a standard deviation of 16.6years. Of the total (447), 61.3% were males and 38.7% were females. By their religious affiliation, 18.3% were of the Christian faith while 81.7% were of the Islamic religion. Most (61.1%) of the respondents were married. Those who were single were 31.0% and 3.6% were widowed, 3.1% were divorced while 1.1% were separated from their spouses.

Table 1: Socio-Demographic Characteristics of Respondents (n=447)

Variables	Frequency	Percentages
Age Range		
<21 Years	78	17.4
21-30 Years	108	24.2
31-40 Years	128	28.6
41-50 Years	83	18.6
>50 Years	50	11.2
Gender		
Male	274	61.3
Female	173	38,7
Religious Affiliation		
Christianity	82	18.3
Islam	365	81.7
Level of Education		
No Formal Education	28	6.3
Primary Education	56	12.5
Secondary Education	177	39.6
Post-Secondary Education	186	41.6
Ethnic Group		
Hausa	139	31.1
Fulani	19	4.3
Other Ethic Groups from Kaduna State	143	32.0
Other Ethnic Groups from Northern Nigeria	38	8.5
Number of Children		
No Children	77	17.2
3 Children & less	185	41.4
4-6 Children	145	32.4
7-9 Children	24	5.4
10 Children & above	16	3.6
Occupation		
Unemployed/Housewife	42	9.4
Self-employed	246	55.0
Faming	21	4.7
Private Sector Employment	53	11.9
Artisan/Daily Labourer	23	5.1
Government/Public Sector Employment	42	9.4
Retired/Pensioners	15	3.4
Others	5	1.1

Monthly Income		
Less than ₦10,000.00	105	23.5
₦10,000 - ₦40,000.00	164	36.7
₦41,000.00 - ₦70,000.00	87	19.5
₦71,000.00 - ₦100,000.00	49	11.0
₦101,000.00 and above	42	9.4

Source: *Field Survey 2025*

In terms of educational attainment, 6.3% of the respondents had no formal or Western education. Those with primary school education were 12.5% of the respondents and 39.6% had Secondary School education. Those with Post Secondary School education were 41.6% of the total involved in the study. The respondents could therefore be said to have had the requisite education to be in positions where they could be expected to provide the required information in relation to household solid wastes management practices within neighbourhoods under study.

By ethnic grouping, respondents of the Hausa ethnic group were 31.1% of the total involved in the study. Those of the Fulani ethnic group were 4.3% and 32.0% were other ethnic groups like Bajju, Jaba, Kadara, Gbagy among others. Those of Southern Nigeria ethnic groups involved in the study were 8.5% of the total. They included, Yoruba, Igbo, Edo among others). Respondents of other Northern states ethnic groups like Igbira, Igala, Tiv. Idoma Jukun among others constituted 24.2% of the total involved in the study. Table 2: showed the socio-economic characteristics of the respondents.

Some (17.2%) of the respondents had no children or did not indicate the number of children they had. Those who had 3children or less were 41.4% and 32.4% of the respondents had between 4 and 6children per family while 5.4% had between 7 and 9children per family. Only 3.6% of the respondents had 10children and above per family. By occupational orientation, 9.4% were either unemployed or were full time housewives among the respondents. Those engaged in self-employed (business or petty trading) were 55.0% while 4.7% were involved in farming. Respondents employed in the private sector were 11.9% of the total while 5.1% were engaged in artisanship or daily paid jobs. Those in public service at the time of the survey were 9.4% and 3.4% of the respondents were retired from service or were pensioners while 1.1% were engaged in other unspecified occupations. The monthly income, 23.5% of the respondents was lower than ₦10,000.00. Those who earned between ₦10,000 and ₦40,000.00 were 36.7% and 19.5% earned between ₦41,000.00 and ₦70,000.00 as their monthly income while 11.0% earned between ₦71,000.00 and ₦100,000.00. Only 9.4% of the respondents earned ₦101,000.00 and above at the time of this survey.

Household Solid Wastes Management Practices among Residents of Low-Income Neighbourhoods/Suburbs.

The study investigated the methods through which solid wastes generated in the various households are collected, processed, transported, recycled and disposed of. The study began with the determination of the compositions of solid waste generated by residents of the study area. The types of waste produced in the households are summarized in frequencies and percentages in Table 2.

Table 2: Compositions of solid wastes generated by households

	Yes		**No**	
Compositions of wastes disposed by household	Freq.	Percent	Freq.	Percent
Products packaging	285	63.8	162	36.2
Furniture/wood	73	16.3	374	83.7
Food scraps or waste	291	65.1	156	34.9
Paper/newspaper	179	40.0	268	60.0
Batteries	51	11.4	396	88.6
Burnt wood ash	229	51.2	218	48.8
Bone	206	46.1	241	53.9
Grass clippings/leaves	142	31.8	305	68.2
Clothing/textiles	208	46.5	239	53.5
Bottles/glass	153	34.2	294	65.8
Electrical/electronic appliances	48	10.7	399	89.3
Metals/can and tins	177	39.6	270	60.4
Rubber/tires/ polythene or plastics	247	55.3	200	44.7

Source: *Field Survey, 2025*

The most outstanding solid wastes generation in the respondents' households were food scraps and product packages. These two forms of waste were mentioned by 65.1% and 63.8% of respondents respectively. Rubber/tires and plastics materials were identified by 55.3% of the respondents as the next most popular source of solid waste, while ashes from burnt wood and other sources was mentioned by 51.2% of the respondents. Table 2 also showed that clothing, nylon or textiles materials (46.5%), Bones (46.1%), pieces of paper and Newspaper (40.0%) and Metals and Can or Tins (39.6%) were the other forms of solid waste reported to be generated by respondents in the study area. Furthermore, the data in the table also showed that 34.2%, 31.8% and 16.3% of the respondents divulged that bottles/glasses, grass clippings/leaves as well as furniture/wood respectively are the some of the solid waste they generate from their homes. The least generated solid waste mentioned by 11.4% and 10,7% of are batteries and electrical/electronic appliances.

Furthermore, the study sought to find out from the respondents if they usually keep or store the waste they generate in their respective households before evacuating such to the dumpsite. Responding to the question posed, an overwhelming 91.7% of respondents indicated that they often store their daily generated waste within their households before it is eventually evacuated to the dumpsite. Those who were not storing solid wastes before disposal were only 9.3% of the total number of respondents involved in the study. In addition, the study examined the various methods through which residents store or keep their waste in their respective household before disposal. On how such solid wastes are kept before disposal. Table 3 shows the different methods of solid waste storage adopted by residents of respective households within the study area.

Table 3: Methods of solid wastes' storage in respective households

Method of solid wastes' storage before disposal	**Frequency**	**Percent**
The waste is kept in uncovered container/refuse bin	131	29.3
The waste is stored in polyene/sacks bags within the house	184	41.2
The waste/garbage is stored in sealed containers	69	15.4
It is dumped in a corner within the compound in the household	40	8.9
Others	23	5.2
Total	**447**	**100.0**

Source: *Field survey, 2025*

As observed from the data in Table 3, all of the respondents store solid wastes in one form or the other before disposal. Those who kept such wastes in uncovered container/refuse bin before final disposal were 29.3% while 41.2% used polyene/sacks bags within the house to store such solid wastes and 15.4% stored their solid wastes in sealed containers. But 8.9% of the respondents dumped their solid wastes in corners within their compound or households while 5.2% stored such solid wastes in unspecified places before disposal.

Information on the rate or frequency of waste generation in each household within the study area was obtained from the respondents. The responses obtained on the regularity of waste generation by households is presented in Table 4.

Table 4: Frequency of solid wastes generation by household

How often do you generate wastes/garbage in your household	**Frequency**	**Percent**
Very often	132	29.5
Often	189	42.3
Sometime	87	19.5
Rarely	39	8.7
Total	**447**	**100.0**

Source: *Field survey, 2025*

Table 4 revealed that a significant proportion of respondents (42.3%) stated that they often generate solid waste in their households, 29.5% of the respondents disclosed that they generate solid wastes most of the time in their respective houses. Respondents who generate was sometimes among the total were 19.5 and 8.7% rarely generate solid wastes from their routine activities. It can therefore be deduced from this data that solid waste is regularly generated by most of the households covered in this study.

As shown in Table 5, the respondents indicated that they generated various quantity of solid waste from their households daily. As revealed in Table 5, solid wastes generated by 47.2% of the respondents were usually between 1kilogram of less. Those whose solid wastes generation were between 2 and 3kilograms were 32.7% of the respondents and 13.0% usually generate between 3 and 4kilogram per household while 4.0% of the respondents usually generate

between 5 and 6kilograms per household. Only 3.1% of the respondents generated between 7kilograms and above per household.

Table 5: Classification of respondents by weight of solid wastes generation in household

Estimated quantity of solid waste generated in household daily	Frequency	Percent
1kg less daily	211	47.2
2-3kg daily	146	32.7
3-4kg daily	58	13.0
5-6kg daily	18	4.0
7kg and above daily	14	3.1
Total	447	100.0

Source: *Field survey, 2025*

The study also sought to find out the opinion of respondents as to whether they expect the amount of solid waste generated in their respective households to increase in the next five years. While 63.3% answered in the affirmative, 36.7% were of the view that they did not expect any increase in their solid wastes' generation within the period. For respondents who expected an increase in their solid wastes' generation in the next five years, Table 6 showed the percentages of the expected increase in solid wastes' generations by the respondents.

Table 6: Expected percentage increase in solid wastes generation of households

Estimated percentage of expected solid wastes of household increase in the next five years	**Frequency**	**Percent**
Not indicated	164	36.7
Less than 5 percent	132	29.5
5-10 percent	99	22.1
11-15 percent	25	5.6
16-20 percent	17	3.8
More than 20 percent	10	2.2
Total	447	100.0

Source: *Field Survey, 2025*

Table 6 showed that 36.7% of the respondents did not indicate expected increase in solid wastes' generation in their households. This no indication could be associated with the expressed opinion where 37.4% of the respondents were of the view that they did not expect any increase in their solid wastes' generation within the period. But 29.5% were pf the opinion that the expected an increase of less than 5% while 22.1% expected between 5 and 10% increase in their household solid wastes' generations. Those who expected an increase of between 11 and 15% in solid wastes generation in their households were 5.6% and 3.8% expected an increase of between 11 and 15% while 3.8% expected an increase of between 16 and 20% in their households' solid wastes generation. Only 2.2% expected their increase of solid wastes generation to be more than 20% within the period.

The various methods of solid waste disposal adopted by respondents in the study area were similarly investigated. The responses obtained from respondents when asked to mention how they dispose of their accumulated waste is shown in Table 7.

Table 7: Methods of solid wastes disposal used by respondents

	Yes		**No**	
Methods of solid wastes disposal	Freq.	Percent	Freq.	Percent
Open Burning	116	26.0	331	74.0
Burying/Landfill	53	11.9	394	88.1
Water drainage	57	12.8	390	87.2
Throwing of waste into bushes	35	7.8	412	92.2
Dumpsite/refuse dump	266	59.5	181	40.5
Garbage truck services	69	15.4	378	84.6
Reuse/Recycling	114	25.5	333	74.5
Used door to door services	99	22.1	348	77.9
Usage of waste as compost/manure	53	11.9	394	88.1

Source: *Field survey, 2025; Multiple Response*

As shown in Table 7, the evacuation of solid wastes from households to designated dumpsites or refuse dumps was the most popular method adopted by majority of the respondents. The data showed that 59.5% of the respondents used this method of waste disposal. Open burning which was mentioned by 26.0 % of the respondents was observed to be

the next most widely used method of waste disposal in the study area. This was followed by reuse or recycling of solid waste which was mentioned by 25.5% of respondents. While 22.1% of the respondents used the door-to-door services to evacuate their household waste 15.4% mentioned using garbage truck services. While the data also showed that 12.8% of respondents dump their waste in open water drainages, 11.9 % of respondents reported burying and usage of waste as composed or manure respectively as their method of disposing their waste. The least adopted method of solid wastes disposal was throwing them into surrounding bush which as practiced by 7.8% of the respondents.

Furthermore, the means by which accumulated waste is evacuated or transported from the respondents' household to the final disposal site was examined. Table 8 showed the different means of solid waste removal used by respondents.

Table 8: Means of transporting generated solid wastes from households to dumpsites

Means by which generated solid wastes were taken to dumpsites	Frequency	Percent
Not indicated	11	2.5
We trek to the dumpsite carrying the waste containers/polyene bags	129	28.9
We use wheel barrow to transport the waste to the dumpsite	108	24.2
We pay people/individuals to take it to the dumpsite	150	33.6
We pay private truck/pick up owners to evacuate our waste	41	9.2
Waste is dumped in front of house for evacuation by garbage trucks	8	1.8
Total	447	100.0

Source: *Field Survey, 2025*

The respondents adopted different modes of transporting their generated solid wastes to their dumps sites as indicated in Table 8. For mode of transporting the solid wastes, 28.9% of the respondents disclosed that they usually trek to the dumpsite carrying the waste containers or bags. While 24.2% of the respondents reported using wheel barrow to transport the wastes to the dumpsite, 33.6% stated that they usually pay individuals to take their solid wastes to the dumpsites. Additionally, 9.2% of the respondents claim to pay private truck or pick up owners to evacuate their solid waste to dumpsites while 1.8% of the stated that they usually dump solid wastes our wastes front of their houses or street for evaluation by trucks. However, 2.5% of the respondents did not indicate the mode or means by which their solid wastes were taken to dumpsites.

The frequency with which accumulated solid waste is disposed of by residents of the various households were also inquired into. Respondents were asked to mention how often they do evacuate accumulated solid wastes from their respective households to dumpsite. The responses they provided are presented in Table 9.

Table 9: The frequency with which solid wastes are evacuated from household to dumpsite

How often do you dispose or evacuate the waste generated in your household to the dumpsite or evacuation point	**Frequency**	**Percent**
Not indicated	4	0.9
Everyday	66	14.8
Once every two to three days	111	24.8
Once a week	199	44.5
Once every two weeks/fortnightly	55	12.3
Once monthly	9	2.0
Others	3	0.7
Total	**447**	**100.0**

Source: *Field Survey, 2025*

Though 0.9% of the respondents did not state the frequency with which they evacuate solid wastes from their households but 14.8% were of the view that they carry out such operation every day, 24.8% performed their solid wastes evacuation once every two to three days, 44.5% carry out the process once in a week and 12.3% evacuate the solid wastes once every two weeks or fortnightly while 2.0% carry out solid wastes' evacuation once a month. However, 0.7% of the respondents indicated that they evacuated solid wastes in other unspecified frequency.
Furthermore, Table 10, showed the persons or agencies responsible for evacuating solids waste from households to designated dumpsite.

Table 10: Individual or agency responsible for solid wastes evacuation or disposal

Persons or agencies responsible for solid wastes evacuation or disposal	Frequency	Percent
Household head/Tenant	218	48.8
Landlord/House owner	57	12.8
Employee/Hire hand	57	12.8
Private collectors	90	20.1
KEPA	15	3.4
Others	10	2.2
Total	**447**	**100.0**

Source: *Field Survey, 2025*

The data in Table 10, reveals that 48.8% of household heads or tenants stated that they are responsible for evacuating solid waste from their respective households to dumpsites. While 12.8% of the respondents disclosed that some Landlord or House owners are responsible for the removal of solid waste from their households, another 12.8% indicated that they usually employ the services of paid individual or hire hands to carry out the responsibility. It was also observed that 20.1% of the respondents mentioned that their solid wastes' is usually collected and disposed of by private collectors who are paid for their services. However, only 3.4% of the respondents indicated that the Kaduna State Environmental Protection Agency (KEPA) was responsible for evacuating their solid waste to the dumpsite while a marginal 2.2% of the respondents stated that other unspecified persons or agencies were responsible for the task.

A chi-square (X^2) test to establish bivariate association between some selected socio-demographic characteristics and methods of waste disposal were conducted. The results of the test revealed that age was not statistically significant with burning of waste, disposal of waste in nearby bushes and the use of garbage truck for waste disposal ($p > 0.05$). However, when age was associated with burying of waste, disposal of waste at refuse dump and the use of door-to-door waste collection services were noted to be significantly significant ($p < 0.05$). Additionally, the methods used for wastes disposal by the residents in almost all cases were not significantly influenced by sex of the respondents ($p > 0.05$). The only exception here was the use of recycling of wastes where it was revealed that sex of residents was significantly influencing the reuse of wastes ($p < 0.05$).

Furthermore, it was observed that the disposal of waste by burning, dumping of wastes in water drainages and use of door-to-door services of wastes collectors were significantly influenced by religion of respondents ($p < 0.05$). However, the burying of wastes, dumping of wastes in the bush, the disposal of waste at dumpsite and reuse of wastes were not significantly influenced by religious orientation of the residents ($p > 0.05$). Methods of waste disposal such as burning, burying, dumping wastes in water drainage, using dumpsite and use of door-to-door services of wastes collectors used by residents were not significantly influenced by their marital statuses ($p > 0.05$). But the adoption of wastes reuse was significantly influenced by marital statuses of the respondents ($p < 0.05$).

Similarly, respondents' level of education was statistically significant with waste disposal methods like burning of wastes, burying of wastes, throwing of wastes into water drainages, use of garbage truck services and recycling of wastes ($p < 0.05$). But waste disposal practices such as throwing of wastes into nearby bushes, the disposal of waste at refuse dump and the use of the door-to-door services of wastes collectors were not significantly associated with respondents' level of education ($p > 0.05$).

4. Discussion

Findings from this study revealed that different types of wastes were generated from the studied households. Prominent among the types of wastes produced, includes food scraps, product packaging, rubber/tires plastics/polythene, clothing/textiles, papers/newspapers etc. This study is in agreement with that of Fakere, Gabriel & Oriye (2012) in Akure. They reported that the respondents generate different types of waste which includes mostly kitchen garbage, ashes, dead animals, etc. A significant proportion (65.1%) of respondents in this study identified food scraps as their most generated household waste.

In contrast, the findings of this study contradict that of Chinwendu & Nkechi (2023) which disclosed that the major type of waste generated by most households in some selected communities in Owerri were plastic and rubbers. This finding is surprising because it is not expected that food scraps would constitute a worthy percentage of the solid waste generated in low-income households, particularly when the current deplorable economic condition in the country is taken into consideration. However, the most plausible explanation of this study's differing finding could be that residents do select reusable plastics or polythene which they either reuse at home or sell to buyers who

in turn sell them to recycling firms. This could be the likely reason why plastics and rubber are less generated as waste than food scraps or debris.

In addition, the assessment of the frequency of waste disposal showed that majority of the respondents (42.5%) dispose of their waste often, while 29.9% said they do so very frequently. This finding varies with that of Udensi, Anyanwu, Opara, Duru, Onyima & Okafor (2023) which reported weekly disposal of waste in their study. The variation in the findings of these studies can be attributed to locations where these studies were conducted. While this present study was specifically conducted in low-income suburbs situated in Kaduna metropolis, Udensi et al, carried out their study in selected villages in three communities of Owerri-west LGA.

The study also observed that generated solid waste are transported from the households to the dumpsites using different means. The payment of individuals or cart pushers to transport waste from households to refuse dump was mentioned by 33.6% of the respondents as the most popular means of waste evacuation in the study area. This finding differs with that of Salisu, Fashina, Akanmu & Sanni (2022) in Lagos which reported that the residents of Ikeja (65.0%) and Ojo (48.0%) used the services of private sector participants (PSP). The differences between the present study and that of Salisu et al can be attributed to the cosmopolitan nature and population density of Ikeja and Ojo LGAs.

This study also revealed that the evacuation of solid waste to refuse dump is the most popular and frequently used method of household wastes disposal in the study area. Other methods identified include burning, dumping of waste in drainages, on the streets, in uncompleted buildings and nearby bushes and so on. The result of this study is not in line with the findings of Yoada, Chirawurah & Adomgo (2014) in urban Accra which showed that majority of the household disposed of their wastes at community bins or had their wastes picked up at their homes by private contractors. The discrepancies in these studies could be attributed to the location/area of these studies. Urban Accra could have a well-organized system of solid waste management practices unlike the area of the present study where there was no provision for picking wastes from homes of the respondents by private contractors.

5. Conclusion

It is evident from the findings of this study that the poor management of household solid waste in the study area poses serious problems and challenges to the health and wellbeing of residents. These challenges are further compounded by the huge quantity of waste generated daily and the absence of an efficient and effective waste disposal system. Furthermore, the absence of rules or bye-laws which specifies the standard procedures for waste disposal is largely responsible for the poor waste management practices existing in the study area. Additionally, the lack of information, high population density, over crowing and inadequate water supply among others have significantly contributed to the poor domestic waste management practices observed in the study area.

6. Recommendations

Considering that food scraps constitute the most significant amount of waste generated from households in the study area it is suggested that the various communities should be taught or exposed to practical skills on how they can convert food debris into compost manure. This natural and organic fertilizer can be used to enhance soil fertility and crop growth. In instances where the compost is produced in large quantities can be sold to gardeners and vegetable farmers.

With regards to plastics, polythene and nylon which was second most produced waste, environmental health workers, healthcare providers and other stakeholders need to create public awareness to on the dangers of improper disposal of plastics and nylon on human health. Nylons and plastics contain chemicals that can enter the body and settle into the system, increasing the toxic load in the body and triggering serious health challenges. Emphasis should be placed on recycling and reuse of these products in order to minimize their negative impact on human health. Proper awareness on the importance of sorting of household wastes will also help in determining appropriate methods of disposing various household wastes.

Similarly, given that the practice of waste burning is widely practiced in the study area it is recommended that residents need to be sensitized on the health and environmental hazards associated with the practice. Additionally, the community and local authorities in conjunction with the Kaduna State Environmental Protection Agency (KEPA) should ensure that refuse dumps or waste collection points are establish within safe distance away from the communities and community leaders should take a more proactive steps towards preventing indiscriminate dumping of waste in drainages and along the streets. Finally, there is also

the need for the respective communities to establish a system of waste management that will allow individuals or private contractors to evacuate accumulated waste from the various households to designated dumpsite.

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