

**AN ASSESSMENT OF THE METHODS OF COLLECTING AND  
DISPOSING OF HOUSEHOLD WASTES IN ZARIA, KADUNA STATE.**

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**Abstract**

*The collection and disposal of household wastes is one of the activities that have been with man. The paper assesses the several methods adopted in the management of waste collection and disposal, and its challenges in Zaria Kaduna State. A set of 200 questionnaires were randomly administered purposively to households to cover parts of Anguwar Aladu (Samaru), Jushi-Waji/Chiki, Chikaji, Kwangila Motor Park, Dogon Bauchi residential area, i.e. 40 per location, being areas with dense population which is most likely to generate high rate of waste. The result is descriptive in nature using statistical tables and charts. The most common types of waste in the study area are cans, cellophane bags (nylon or leather), food left over covers, glass, plastics paper/carton and vegetables. Some of the methods of waste collection identified include the use of bags, waste containers, cartons, baskets in the area. The methods of waste disposal revealed in the study area are dumping in refusesites and water bodies (32%), open burning 48%, clearance by the state waste management Authority 20%. Part of the recommendations is that of intensifying the effect of government intervention by providing more waste containers, clearing and disposing of the collected waste. There is also the need for public enlightenment on proper waste collection and disposal system adoption by the Kaduna State government and individuals. There should be the stipulating of laws against indiscriminate dumping of wastes in the environment and offenders should be punished for breaking the law.*

**Keywords: Assessment, Methods, Wastes Collection, Wastes Disposal and Household wastes.**

**Introduction**

The collection and disposal of waste is an essential part of any society because man will always generate and manage waste in the course of his daily living. The management of waste has become an area of major concern in Nigeria (Akinwale, 2005). Waste is any substance whether gaseous, liquid, solid that is residual and unwanted material. It can be in the form of plastic metals, oil, paste, organic matter and other commodities (THERRA,

2006, Stanley *et al* 2012). Ita (2000) says waste is any material that lacks direct value to its producer and so it must be disposed of. Waste materials can either be hazardous or non-hazardous when determining the health risk to the environment, man inconclusive. Hazardous waste may include particles or cleaning fluids that create potential pollution changes (USEPA 2008). Waste is any material rejected as worthless, having no further use for production, transformation or consumption and it is directly linked to human development socially and technologically (UNDS,2005; Jennifer and James, 2010 and).

. Most Nigerian cities generate waste at an alarming rate often beyond what the various governments can handle. In fact the amount of waste tends to grow with the increase in population, production and consumption in Nigeria (Ishoka 2008, Ojeka 2011 & Sunday 2013). .It is a common sight in Nigerian cities to see accumulation of waste dumps. By extension, Zaria is not left out in the problem of waste collection and disposal in Nigeria. This indiscriminate dumping of refuse has being attributed to the lack of effective waste management in the country and lack of infrastructure for solid waste management leaving negative impact on man and the environment (Akinwale 2005, Ojo 2008, Osibanjo 2008, Bogoro and Babanyaro 2011, Stanley *et al* 2012,).

According to Ojo (2008) wastes are generated mostly in Nigerian urban centres. He believes that an average of 0.14m<sup>3</sup> household waste is generated per week in Anambra State and almost 19000 metric tons is generated in Osun urban centres every month. In Kano municipal by 2007 about 377, 126 tons of waste was also generated (Afolabi and Adamu, 2008).

Agunwamba (1998) and Ishoka (2008) believes that while some industries dump their waste at times within their premises, most households in Nigeria disposes theirs along drainage channels like gutters breeding insects like cockroaches, flies, maggots and mosquitoes causing health hazards.

While Awosika *etal*(1992) asserted that, this indiscriminate dumping of refuse causes the blockage of roads. Waste is collected as they are gathered together to prevent indiscriminate littering in the environment. After the collection should be the disposition.

These research works have not dealt with the assessment of the methods of collecting and disposing of household wastes in parts of Zaria in Kaduna State. It has become necessary to carry out a research of this nature.

This research work intends to find answers to the following research questions;

- i. What are the methods adopted by the households in collecting waste in Zaria, Kaduna State?
- ii. How are the wastes collected and disposed-off in the study area?
- iii. Which proper way(s) should be used apart from the usual practices?

The Research hypotheses to be tested are as follows;

**H<sub>0-1</sub>:** Educational Status of respondents is not correlated to the method of waste disposal used in Zaria.

**H<sub>0-2</sub>:** Educational attainment is not a function to the frequency of waste disposal by respondents in the study area.

### **The Study Area**

Zaria the study area is located in Kaduna State. It is located on latitudes 11°8"-11° 12"N and longitudes 07°36"-07°45". Zaria is part of the Hausa plains of Northern part of Nigeria (Yakubu 2008, Loms 2014). Zaria is an heterogeneously densely populated part of Kaduna, a population of almost two million people based on the projection of 2006 census and is second in population to Kaduna town, the state capital.

Zaria experience a Tropical Continental type of climate with five months of rainy season from May to September or October at times dry season for seven to eight months from October to May annually. Within the dry season harmattan is experienced and likewise is the hot season (Akintola,2014).There are lots of institutions, like Ahmadu Bello University, Nigerian College of Aviation Technology, Federal College of Education and Nuhu

Bamalli Polytechnic to mention but a few, and markets and motor parks and other infrastructural facilities. Apart from these mentioned infrastructures, there are a lot of residential areas in Zaria which generate waste, but the study focused on Zaria with specific interest to areas such as Angwan Aladu in Samaru, Jushi-Chiki and waje, Kwangila motor park site, Sabon Gari / Dogon Bauchi residential areas and Chikaji settlements.

### **Methodology**

The research work adopted field survey of observation, primary data source through the administration of questionnaires and secondary data source with review of relevant literature. The observations carried out include observing the refuse dumping site, household refuse collection bins and the method adopted for disposal.

The 200 structured questionnaires based on research objectives and questions were randomly administered purposively to households specifically for the collection and disposal of the waste generated in designated areas of Zaria in Kaduna State. Those designated areas are Angwan Aladu in Samaru, Jushi-Waji/Chiki, Kwangila Motor Park site, Sabo/DogonBauchi residential area and Chikaji. These areas are the sampled areas in Zaria and 40 questionnaires were administered randomly but purposively to households with a view to assessing the methods of collecting and disposing of wastes in households. All the questionnaires administered were retrieved back, by the researchers. The questionnaires were analyzed using simple descriptive statistical tools of percentages and frequency Tables. These result presentations gave inferential and descriptive analysis.

### **Result and discussion**

This aspect of the paper deals with the socio-economic characteristics of the respondents, the several methods of waste collection and disposal among other issues. The socio-economic characteristics of the respondents are reflected and discussed in the Tables below:

**Table 1: Socio-Economic Characteristics of Respondents.**

<b>Sexes of Respondents</b>	<b>Frequency</b>	<b>Percentages</b>
Females	90	45
Males	110	55
<b>Age group of respondents</b>	<b>Frequency</b>	<b>Percentages</b>
15-19years	5	2.5
20-24years	10	5.0
25-29years	20	10.0
30-34years	35	17.5
35-39years	40	20.0
40-44years	20	10.0
45-49years	10	5.0
50-54years	30	15.0
55-59years	20	10.0
60years and above	10	5.0
<b>Educational background of sampled groups</b>	<b>Frequency</b>	<b>Percentages</b>
Illiterate(non-formal education)	3	1.5
Primary school leaver	5	2.5
Secondary School leaver	10	5.0
N.C.E Leaver	50	25.0
Polytechnic Leaver	47	23.5
University graduate	85	42.5
<b>Total</b>	<b>200</b>	<b>100</b>

Source: Field Survey, 2019

From the socio-economic characteristics in Table 1 above, sex ratio shows that 55% of the respondents are males while 45% are females; but, 20% of the Respondents are within the age group of 35 to 39 years, 17.5% are also within 30 to 34 years of age while 15 to 19 years have the least percentage of 2.5%. In relation to sex of respondents, Ramatta, Dennis and Philip (2014) work, on domestic waste disposal practice and perceptions of private sector in Urban Accra, differ from this work findings in the sense that, the female were more in number (i.e. 50.3% to 49.7%) using a mixed-method approach of questionnaire administration and in-depth interviews, they established that sexes (i.e. male and female) were almost evenly distributed (divided). For Keita (2016) in Sridhar(Ed) who study the factors influencing Household waste collection in Guinea, accredited sex of respondents and established that majority of them were female (67.9%) with male forming only 32.1%.

On the issue of the educational background of the respondents, those who are university graduates have the highest percentage with 42.5%, this is followed with Nigeria Certificate in Education which is 25.0%. Those without formal education had the least 1.5%.

Keita opscit further unveiled that the major age group-carder involved in household refuse collection fall within 15-39 years as established in this research. Though the majority of respondents in Zaria urban area are more of University Graduates (Degree), Nigerian Certificate of Education and Diploma holders ( i.e. 42.5%, 25% and 23.5%) respectively, but Ramatta *etal* (2014) and Keita (2016) respondents were majorly non-formal or illiterates (51.7%) and married.

**Table 2: Household wastes collection and depositing methods**

<b>Methods of waste collection</b>	<b>Frequency</b>	<b>Percentages</b>
a) The use of cellophane bags	10	5.0
b) The use of waste cartons/containers	92	46.0
c) The use of waste bin/basket	72	36.0
d) All of the above	26	13.0
<b>Methods used to dispose-off the waste collected</b>	<b>Frequency</b>	<b>Percentages of waste collected</b>
a) Waste basket	44	22.0
b) Truck	4	2.0
c) Send the boys that clean (mai-shara)	14	7.0
d) Containers	74	37.0
e) Wheelbarrows	44	22.0
f) Burning	20	10.0
<b>Responses on indiscriminate waste experience</b>	<b>Frequency</b>	<b>Percentages</b>
Yes	170	85.0
No	30	15.0
<b>Choices of final areas of waste disposal</b>	<b>Frequency</b>	<b>Percentages</b>
a) Farms	90	45.0
b) Open land	60	30.0
c) Dug-pits or open dug-pits	16	8.0
d) Burned	12	6.0
e) Ponds or stream sites	10	5.0
f) Zaria Dam	10	5.0
g) No response	02	1.0
<b>Alternative waste disposal management technology used by respondents</b>	<b>Frequency</b>	<b>Percentages</b>
a) Pyrolysis (i.e. through decomposition)	88	44.0
b) Combined heat and power	24	12.0
c) Community composition	50	25.0
d) Food waste disposer (incinerators)	22	11.0
e) Automated Vacuum collection system	8	4.0
f) Others specify (bin, basket, side of residential areas)	6	3.0
g) No response	2	1.0
<b>Location of waste points in the area</b>	<b>frequency</b>	<b>Percentages</b>
a) Roadway best areas	28	14.0

b) Roadway layout	50	25.0
c) Maneuvering (corner) areas	60	30.0
d) Permitted access	60	30.0
e) Others specify (back of the house)	2	1.0
<b>Reasons of indiscriminate waste disposal</b>	<b>Frequency</b>	<b>Percentages</b>
a) Absence of waste management services	40	20.0
b) Ignorance and lack of law enforcement units	68	34.0
c) Lack of valuing the importance of the environment	36	18.0
d) Irresponsible behavior of residence	18	9.0
e) Population increase	14	7.0
f) Lack of sensitization programme to ensure good sanitation	19	9.5
g) Others specify	5	2.5
<b>Total</b>	<b>200</b>	<b>100</b>

Source: Field Survey, 2019

From the methods of collection and depositing Table 2 above, indicates that 46-82% used waste cartons/containers and waste bin/basket. Though all methods are practiced (used) in the study area but the above two are most common. The disposal methods used include; containers (37%), waste basket & wheel barrows (22% each) among others.

Due to the methods and conveyors used, the areas experience indiscriminate waste disposal with the majority (85%) of respondents attesting to that.

The major disposal sites are the farmland and open-land with 30% attestation respectively; but the majority respondents used dug/open pits, ponds/stream sites while others burn it.

In Urban Accra, Ramatta *etal* (2014) confirmed the use of community bins and waste picked-up by private contractors to convey the waste and further depositing it into gutters, streets, holes and nearby bushes which causes inconvenience, environmental pollution and posing a public health risk.

For alternative waste disposal management technology used, respondents majorly used the pyrolysis system (44%), through decomposition and community composition (25%). The most disturbing aspect is the waste location disposal points which are at permitted access ways, corners and roadway layouts. Reasons for the indiscriminate waste disposal are tied to ignorance/lack of law enforcement (34%) and other reasons are the lack of environmental value habit and sensitization programmes to ensure good sanitation.

**Table 3: Method of Waste Disposal and Educational Status**

S/No	Educational Status	Open burning	Channel Dumping	Sanitary Landfills	Incinerator	Composting	Ploughing in the field	Total
i	Non-formal	71	13	11	-	1	2	98
ii	Primary	28	3	6	-	4	1	42
iii	Secondary	11	1	1	-	5	1	19
iv	NCE	5	-	-	5	6	2	18
v	Diploma/HND	4	1	1	3	1	-	10
vi	≤ Degree	2	-	1	7	3	-	13
	<b>Total</b>	<b>121</b>	<b>18</b>	<b>20</b>	<b>15</b>	<b>20</b>	<b>06</b>	<b>200</b>

Source: Field Survey, 2019

**Answering the 1<sup>st</sup> Null Hypothesis Using ANOVA**

Where  $H_0 = M_1=M_2=M_3=M_4=M_5$

The sample size is  $=5 \times 6=30$

$N=30$  &  $df_A=n-1=30-1=29$

**Table 4: Reducing the values to the nearest minimum**

S/No	Freq. of disposal	Non-formal	Primary	Secondary	NCE	Diploma	Degree	Total
1	Frequently (A)	0.01	0.02	0.05	0.24	0.17	0.42	0.91
2	Hourly (B)	0.00	0.01	0.02	0.10	0.21	0.20	0.54
3	Daily (C)	.02	0.02	0.03	0.10	0.07	0.15	0.39
4	Weekly (D)	-	-	-	0.05	0.01	0.05	0.11
5	Monthly (E)	-	-	-	0.01	0.01	0.03	0.05
	Total	0.03	0.05	0.10	0.50	0.47	0.85	2.00

Source: Field Survey, 2019

**Table 5: Summary Table**

SOURCE	SS	DF	MS	F
Between samples	0.214	4	0.054	27
Within samples	0.061	25	0.002	
<b>Total</b>	<b>0.275</b>	<b>29</b>		

Source: Field Survey, 2019

F-ratio for df (4, 25) is 2.76 from the F-Distribution table.

Since the calculated value (27) is greater than the F-Distribution table value (2.76), the null hypothesis is hereby rejected, meaning there is a significant relationship between educational status of respondents and the methods used for disposing off waste in Zaria.

Though from the educational status table, the literate respondents seems to be more to respond, but from waste disposal methods used versus educational status, the result clearly showed that the non-formal educators with 95 respondents took the lead in the use of the in-formal/unsaved methods of open burning, channel dumping and sanitary landfills disposal while only 14 NCE, Polytechnics and Degree holders used such methods out of 159 users.

**Table 6: Waste Disposal and Collection Practices**

<b>Method of waste disposal best used in the area</b>	<b>Frequency</b>	<b>Percentages</b>
a) Opening burning	116	58.0
b) Dumping into water channels	10	5.0
c) Sanitary landfills	20	10.0
d) Incineration	25	12.0
e) Composting	20	10.0
f) Ploughing in fields	2	1.0
g) Hay feeding	2	0,5
h) Grinding and discharging into sewers	2	1.0
i) Salvaging	4	2.0
j) Fermentation and biological digestion	2	1.0
<b>method of waste collection used</b>	<b>Frequency</b>	<b>Percentages</b>
a) House to house	38	19
b) Community bans	30	15
c) Curbside pick-up	2	1
d) Self- delivered	68	34
e) Contracted or delegated services	6	3
f) Wheeled barrow collection	34	1
g) Refuse collection vehicle	20	17
h) Tankers for liquid waste	--	10
<b>Major socio-economic impact of indiscriminate waste disposal in the area</b>	<b>Frequency</b>	<b>Percentages</b>
a) Huge probe traffic along streets	58	29.0
b) Increase in turbidity of market and substance of the area	34	17.0
c) Decrease in patronage of business in the area	50	25.0
d) Increase of residence which leads to reduction in their productivity	28	14.0
e) Other impacts specify smelly	20	15.0
f) No response	-	-
<b>Frequency of refuse disposal</b>	<b>Number of respondents</b>	<b>Percentages</b>
a) Hourly	10	5.0
b) Daily	62	31.0
c) Weekly	60	30.0
d) Monthly	36	18.0
e) Frequently	32	16.0
<b>Total</b>	<b>200</b>	<b>100</b>

Source: Field Survey, 2019.

From the Waste Disposal and Collection Practices Table above, the findings outlined that, out of the ten (10) identified methods of waste disposal systems used, open-burning is the most commonly used with 58% out of



100% respondents consenting to that. Ploughing, hay feeding, grinding and fermentation/biological digestion are the unpopular and least used methods. In furtherance to that, self-delivered (34%) and house to house collection (19%) are the most employed methods of collection which has constituted major socio-economic impact/effects such as; huge probe traffic (29%) along streets with a decrease in patronage of business areas (25%), increase in market turbidity (17%) and a reduction in residential productivity (14%) respectively.

**Table 7. Educational Background and Frequency of Waste Disposal**

S/No	Frequency of waste Disposal	Educational Status						Total
		Non-formal	Primary	Secondary	NCE	Diploma/HND	University	
A	Frequently	1	2	5	24	17	42	91
B	Hourly	-	1	2	10	21	20	54
C	Daily	2	2	3	10	7	15	39
D	Weekly	-	-	-	5	1	5	11
E	Monthly	-	-	-	1	1	3	5
	Total	3	5	10	50	47	85	200

Source: Field Survey 2019

**Testing the 2<sup>nd</sup> Null Hypothesis using ANOVA,**

Where;  $H_0 = M_1 = M_2 = M_3 = M_4 = M_5 = M_6$

$N = 36$  while  $df_A = n - 1 = 36 - 1 = 35$

The,  $df_w = df_A - df_B = 35 - 5 = 30$

**Table 8: Reducing the values in the Table to the nearest minimum**

S/N	EDUCATIONAL STATUS	METHODS OF WASTE DISPOSAL						Total
		Open Burning	Channel Dumping	Sanitary Landfills	Incineration	composting	Ploughing in the field	
a	NON-FORMAL (A)	0.71	0.13	0.11	-	0.01	0.02	0.98
b	PRIMARY (B)	0.28	0.03	0.06	-	0.04	0.01	0.42
c	SECONDARY (C)	0.11	0.01	0.01	-	0.05	0.01	0.19
d	NAT.CERT.OF EDU. (NCE) (D)	0.05	-	-	0.05	0.06	0.02	0.18
e	DIPLOMA/HND (E)	0.04	0.01	0.01	0.03	0.01	-	0.10
f	DEGREE (F)	0.02	-	0.01	0.07	0.03	-	0.13
	<b>TOTAL</b>	<b>1.21</b>	<b>0.18</b>	<b>0.2</b>	<b>0.15</b>	<b>0.2</b>	<b>0.06</b>	<b>2.00</b>

Source: Field Survey 2019

$G = \sum S_{ij} = S_A = 2.00$

**Table 9: Summary Table of ANOVA**

SOURCES	SS	DF	MS	F
M. Between samples	0.205	5	0.041	3.73
M. Between samples	0.335	30	0.011	
<b>Total</b>	<b>0.540</b>	<b>35</b>		

Source: Field Survey 2019

The F-ratio for df (5, 30) is 2.63 from the F.Distribution table where the critical value of F-ratio under the curve to the right is equal to 0.05 or 5%. Thus, since the calculated value (3.73) is greater or higher than the F-Distribution table value of 2.63, hence the null hypothesis is hereby rejected, meaning, there is a significant relationship between the educational background of the respondents and the indiscriminate disposal of waste in the study area (Zaria).

This inference was drawn from the Table comparing educational status and frequency of waste disposed by respondents above which significantly indicates that the learned (i.e. University, NCE and Polytechnic graduates) regularly disposed of waste than the Non-formal, Primary and Secondary certificate holders. This behaviour may not be far from the respondents' income status as UNDS (2005) defined waste as any material rejected as worthless, having no further use for production, transformation or consumption and it is directly linked to human development socially and technologically.

## CONCLUSION

The issue of collection and disposal of household waste in the world is one of the oldest activities of man. Densely populated areas are mostly generators of high rate of wastes. The most common wastes generated in the study area are cans, cellophane bags (leather or nylon), leftover food covers, glass, paper/carton, plastic, vegetables among other things. The methods

used to dispose of waste include the use of bags, containers, cartons and waste baskets. These wastes are dumped in refuse sites, water bodies, burning openly or cleared by Kaduna State Waste Management Authority. The researchers also observed that there is a significant relationship between the educational status of the respondents and the methods adopted / frequency for wastes disposing off in Zaria.

There are several challenges identified in the study area and these are indiscriminate dumping of refuse in the environment thereby causing odour and diseases to the populace. Another challenge is that of inadequate sensitization or the need for public enlightenment on proper waste collection and disposal in the study area.

## RECOMMENDATION

From the major findings made, the following recommendations are inferred / suggested:

- i. Since there is the problem of inadequate sensitization on proper collection and disposal of waste in the study area, the Kaduna State Government and good spirited individuals should create adequate public enlightenment on proper waste collection and disposal systems to be adopted in the study area. The enlightenment should include the health hazard of the impact of waste on man. This will improve the value on the importance of a clean environment.
- ii. The State Government should stipulate laws against indiscriminate dumping of waste and offenders should be made to face the wrath of the law.
- iii. The Kaduna State Government should increase the number of vehicles used by the waste management Authority and also increase the staff strength in the unit.
- Iv. The State Government should engage health officers to inspect homes and environment of the citizens in the study area and sanction defectors

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