



Assessment of Household Solid Waste Management in Chiroma Ward of Lafia Local Government Area, Nassarawa State, Nigeria

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Abstract

This study assessed household solid waste management in Chiroma ward of Lafia Local Government Area, Nassarawa State, Nigeria. The objectives of the study were to spatially map waste dump sites in Chiroma ward, determine the most effective waste collection practice, evaluate the various types of waste generated and determine the most effective waste disposal practice in study area. Mix-approach of multistage, cluster and purposive techniques were adopted for the study. Thus, 400 questionnaires were administered to household respondents after the sample size was determined by Yamane formula. Household solid wastes were collected by self-collection practice having the highest response with mean of 4.2821 and standard deviation of 3.4910. Agricultural and food wastes were the most commonly generated in Chiroma ward, having a mean of 3.8923 and standard deviation of 3.6494 indicating high response. Open dump household waste disposal practice had the most effective response with a mean of 4.3077 and standard deviation of 3.8938. The study has recommended the engagement of government to manage waste by making and enforcing waste management laws as well as get involved in waste collection, transportation and disposal practices. Public and private sector partnership should be engaged to reduce, reuse and recycle household solid wastes in order to promote sustainable waste management practice and healthy environment of Chiroma ward.

Introduction

Globally, waste is causing severe environmental and health challenges to cities due to poor management and regulation. The consumption of material resources has resulted to generation of waste. Improper management of waste has resulted to environmental degradation thereby posing health challenges to community dwellers [1]. The attention is given to household solid waste as part of the disturbing sources of waste generation especially in developing countries like Nigeria. Urbanization, industrialization and overpopulation have immensely contributed to high generation of solid wastes in both urban and semi-urban areas. Increase in consumption of things will continue to contribute to waste generation [2]. Thus, resource consumption and rise in households will continue to impact on waste volumes. However, the most concern of poor solid waste management is the associated environmental pollution in land, water and air [3].

Worldwide, the process of waste management requires a chain of activities from collection, sorting, transporting and disposal. If any of these lines of management is disrupted, it will affect the waste management practice. Thus, how this practice will be efficiently known for its environmental

hazards, the inability of societies to manage waste generation effectively play no small role in increasing severe environmental pressures in solid waste management scheme [4]. There is groundwater pollution when harmful waste comes in contact with water bodies. When rain water comes in contact with waste dump and percolates into the soil, it can become polluted and can carry the pollution from the top soil to the under groundwater [5]. Sometimes, water bodies such as rivers and creeks are contaminated due to dumping of waste thereby killing both aquatic flora and fauna species. Also, some solid wastes are burnt in the open air which is capable of making the air very toxic for city dwellers especially those who have respiratory health challenges [5].

Household sold waste is one of the greatest dangers facing mankind on earth which demands immediate attention at the regional, national and international level in order to curb this danger that is hazardous to the human environment [6]. The high increase of solid waste and its improper management are major problems of any municipal area which results from urbanization, industrialization and population rise at geometric rate [7]. The challenge of solid waste management is peculiar with low income countries due to population rise and urbanisation [8]. The practice of solid waste management

is an integral part for a city to function properly. The state and local government areas are tasked with the responsibility of managing solid waste. There has been a phenomenal rise in the volumes of waste generated daily from the residents to commercial areas especially along major routes in the cities [9]. Improper disposal, collection, evacuation and disposal of solid waste is an indication of a failing city and a major drawback in the quest to achieve sustainability.

Waste management is a critical practice in developing countries. For example, Nigeria is one of the developing countries that is marred with menace of indiscriminate refuse dump. The current practice of Nigeria on household solid waste management indicates a great avenue for strategic improvement. Consequently, the existing solid waste recovery levels are far below the desirable [10]. In this vein, the double function of Lafia metropolis as the state capital and local government headquarters have increased the population of the town and thereby raised the solid waste being generated with little or no increase in the capacity of the responsible agency. This has led to massive garbage round the town. With the establishment of Nasarawa Urban Development Board in 1996, one would have thought the orthodox waste management practices should have changed or improved upon, but the town is still bedevilled by the scourge of a filthy environment [11]. The authority could not control the urban development as well as waste disposal sites that are scattered all over the town resulting to unhealthy environment.

Waste generation is a global problem. The problem of household solid waste management cut across the collection, transportation and disposal practices. It involves the categories of household wastes generated, reuse, reduce and recycled. Chiroma ward is not exception considering the severe challenges posed by waste generation. In this vein, this study has assessed household solid waste management in Chiroma ward of Lafia Local Government Area, Nassarawa State, Nigeria.

Materials and Method

Chiroma Ward in Lafia is the study area. Lafia is the capital city of Nasarawa State. It lies within latitude $8^{\circ}28'30''\text{N}$ to $8^{\circ}30'45''\text{N}$ and Longitude $8^{\circ}30'45''\text{E}$ to $8^{\circ}35'15''\text{E}$. Chiroma is the largest ward in Lafia town. Figure 1 showed the study area map of Lafia in Nigeria.

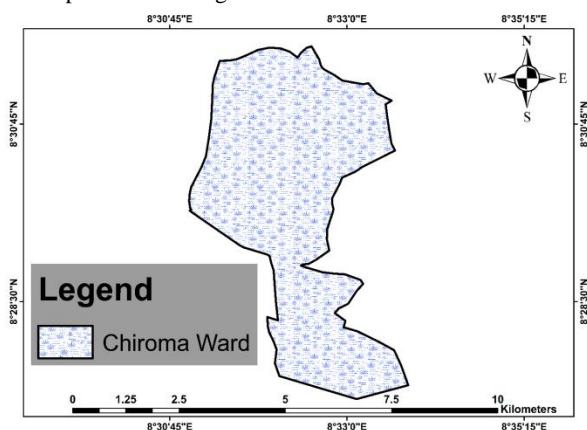


Figure 1: Map of Chiroma Ward

Chiroma ward experiences two seasonal conditions of the wet and the dry seasons. In Chiroma ward, the hot season lasts for 4 months, from January to April, with an average daily high temperature above 34.4°C . The hottest month of the year is March, with an average high temperature of 36.1°C and low temperature of 23.9°C [12]. The cool season lasts for 5 months, from June to October, with an average daily high temperature of 30°C . The coldest month of the year in Chiroma is December, with an average low temperature of 18.3°C and high temperature of 32.2°C . The total annual rainfall is in the range of 1100mm to 1600mm [12]. The study area is made up of basement complex rocks composed of granites and gneiss. Groundwater occurrence in these terrains in the (upper) weathered parts of the basement or in fractures. The depths vary depending upon location but tend to be in the 20-60m range [13]. The most common tree includes *Azalia Africana*, *Anogeisus*, *Leiocapus*, *Vitex Doniana* etc. The Shrubs contain trees species such as *Antiaris Africana*, *Anthrocleisat Nobils*, *Ceiba Pentandra* etc [14]. The area falls within the guinea savannah zone characterized by scattered trees and grasses (Ayoade, 2004). The study area has 2023 projected population of 80,453 persons [15]. The economy of Chiroma in Lafia LGA is majorly farming and trading.

The cross-sectional survey design was used for this study. The researcher's source of primary data was the questionnaire. Population data was sourced from National Population Commission (NPC) as secondary data. Population of this study comprises of the residents of Chiroma ward in Lafia Local Government Area of Nasarawa State. The study area is one of the eleven (11) wards that make up Lafia Local Government Area and largest ward in the LGA. The study area has a projected population of 80,453 persons [15]. The sample size was derived from the total population of 80,453 in Chiroma ward by applying formula of [16]. Thus, 400 questionnaires were administered. The research instruments used for this study were structured questionnaire which was used to gather data from the respondents on domestic waste management practice. The questionnaire was structured in four (4) sections. Section A, was the background information of respondents, section B captured data on waste collection practice, section C generated data on types of waste and section D determined waste disposal practices in the study area. The questionnaire adopted the Linkert 5-Point Scale showing 1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree respectively.

For the questionnaire administration, mixed techniques of multistage, cluster and purposive sampling were adopted. For the multistage sampling technique, Lafia Local Governemnt Area was selected out of the thirteen (13) LGAs in Nassarawa State. Out of the eleven (11) wards in Lafia LGA, Chiroma was selected for the study. This is because Chiroma is the largest ward and a municipal area in Lafia Local Gogernment Area. The study adopted cluster sampling technique as questionnaires were administered in three clusters of Government Residential Area (GRA), general residential area and slums in order to capture waste management data across the various residential household types in the study area.

Finally, the 400 questionnaires were purposively administered to various households in Chiroma ward of Lafia LGA in Nassarawa State. Purposive sampling technique was used based on the judgement of the researcher. The questionnaires were analysed using mean, mean square and standard deviation and weighted average in order to understand the levels of response to household solid waste management.

Results and Discussion

Table 1 indicated that out of the 400 questionnaires administered, 390 were retrieved (97.5%) due to the fact that the field assistants were knowledgeable, hardworking and there was high engagement of the respondents during the reconnaissance survey. The significance of this result showed that a large quantity of the stakeholders who responded were familiar with current issues of household solid waste management, therefore making the result outcome very dependable and reliable.

Table 1: Response Rate

Respondents	Number of Questionnaires Administered	Number of Questionnaires Retrieved	Number Not Retrieved	Retrieved Percentage	Not Retrieved Percentage	Cumulative Percentage
Household questionnaires	400	390	10	97.5	2.5	100

The characteristics of respondents influence the result of a study. Therefore, this study considered some demographic variables of respondents who participated in the administered questionnaires (Table 2). The information of respondents was sex, age and education. The background information showed 65.90% male and 34.10% female who responded to the administered questionnaires. The respondents below 25 years were 17.70%. The respondents at 26-30 years (28.97%) and 31-40 years (30.51%) had the highest engagement, indicating that those in the active age dominated in responding the questionnaires. As for educational background of the respondents, those who graduated from colleges of education (21.03%), polytechnics (18.72%) and universities (17.17%) responded more in the administered questionnaires. The other group was those from other higher institutions of learning recording 15.64% respectively.

3	Highest Level of Education:	Primary Education	50	12.82
		Secondary Education	57	14.62
		College of Education	82	21.03
		Polytechnic	73	18.72
		University	67	17.17
		Others	61	15.64
		Total	390	100.0

Table 2: Background Information of Respondents

S/N	Characteristics	Respondent's Category	Frequency	Percentage
1	Sex	Male	257	65.90
		Female	133	34.10
		Total	390	100.0
2	Age	Below 25 Years	69	17.70
		26-30 years	113	28.97
		31-40 years	119	30.51
		41 years and above	89	22.82
		Total	390	100.0

Table 3 showed the most effective waste collection practice in Chiroma ward in Lafia Local Government Area. Household solid wastes were collected by self-collection practice having the highest response with mean of 4.2821 and standard deviation of 3.4910. This was followed by household solid waste as being collected by private door to door collectors with mean of 3.3154 and standard deviation of 2.8339 respectively. Household solid waste being collected by government door to door collectors was poor with mean of 1.8513 and standard deviation of 1.6432 indicating that the government did not give adequate concern in collecting household solid waste in Chiroma ward. The implication that individual households put more effort in collecting household solid waste and the low involvement for government to collect waste means that waste had overwhelmed the people of Chiroma residents. The people of the study area were vulnerable to waste disaster and high risk of environmental degradation.

Table 3: Waste Collection Practice in Chiroma Ward

S/N	Response	SA	A	N	D	SD	Total	Mean	SD	Decision
Household Waste Collection Practices										
4	Household solid waste is collected by private door to door collectors	177	23	3	101	86	390	3.3154	2.8339	High Response
5	Household solid waste is collected by government door to door collectors	25	34	5	120	206	390	1.8513	1.6432	Low Response
6	Household solid waste is collected by self-collection practice	271	49	1	47	22	390	4.2821	3.4910	High Response

1= Strongly Agree (SA) 2= Agree 3 (A) = Neutral 4 (N) = Disagree 5 (D) = Strongly Disagree (SD and Weighted Average = 2.6560
 Table 4 showed various types of household solid wastes in Chiroma ward. Agricultural and food wastes were the most commonly generated in the study area, having a mean of 3.8923 and standard deviation of 3.6494 indicating high response. This was followed by plastic waste generation with mean of 3.2487 and standard deviation of 3.1639, indicating high response. Thus, polythene and sachet water waste were the third most commonly generated with a mean of 3.1128 and standard deviation of 2.9071 showing a high response respectively. Glass waste, metal and iron waste, wood waste as well as textile and cloth wastes received a low response below the weighted mean of 2.8308. The results indicated that in Chiroma ward, agricultural and food waste were the most generated and the least waste generated was metal and iron. Thus, many households were capable of generating high volumes of agricultural and food wastes as these were daily consumables. The least generated metal and iron wastes were due to the influence of human scavengers who on daily basis pick metal and iron wastes for marketing to recycling companies.

Table 4: Types of Household Solid Waste

S/N	Response	SA	A	N	D	SD	Total	Mean	SD	Decision
Types of Household Solid Waste										
7	Agricultural/food waste is the most commonly generated	197	95	2	51	45	390	3.8923	3.6494	High Response
8	Plastic waste is the commonly generated	151	56	1	103	79	390	3.2487	3.1639	High Response
9	Glass waste is the most commonly generated	18	97	5	108	162	390	2.2333	2.1304	Low Response
10	Metal/iron waste is the most commonly generated	11	77	3	171	128	390	2.1590	1.9640	Low Response
11	Wood waste is the most commonly generated	24	103	4	123	136	390	2.3744	2.2566	Low Response
12	Textile/cloth waste is the most commonly generated	121	33	3	111	122	390	2.7949	2.6957	Low Response
13	Polythene/sachet water waste is the most commonly generated	139	43	2	135	71	390	3.1128	2.9071	High Response

1= Strongly Agree (SA) 2= Agree 3 (A) = Neutral 4 (N) = Disagree 5 (D) = Strongly Disagree (SD and Weighted Average = 2.8308

Table 5 revealed the most effective household waste disposal practice in Chiroma Ward. Open dump household waste disposal practice was the most effective response having a mean of 4.3077 and standard deviation of 3.8938. This was followed by waste disposal through burning which had high response mean of 4.1462 and standard deviation of 3.7710. Burying waste underground had a mean of 2.7538 and standard deviation of 2.6833, while dumping in water bodies had a mean of 3.0051 and standard deviation of 3.0137 indicating a low response as their mean values were below the weighted mean of 3.5532. The implication of the results showed that open dump of waste would litter the environment with refuse and degrade the aesthetic value of the area as well as cause high contamination of land and water bodies. Also, the high practice of burning waste in an open space would contaminate the air by releasing harmful emissions of poisonous gases into the atmosphere which is capable of degrading the health of those especially with respiratory diseases.

Table 5: Household Solid Waste Disposal Practice

S/N	Response	SA	A	N	D	SD	Total	Mean	SD	Decision
Household Solid Waste Disposal Practices										
14	Household wastes are disposed using open dump	201	152	3	24	10	390	4.3077	3.8928	High Response
15	Household wastes are disposed by burning	176	163	1	32	18	390	4.1462	3.7710	High Response
16	Household wastes are disposed by burying underground	41	156	6	40	147	390	2.7538	2.6833	Low Response
17	Household wastes are disposed by dumping in water bodies e.g. river, stream, etc	142	40	17	60	131	390	3.0051	3.0137	Low Response

1= Strongly Agree (SA) 2= Agree 3 (A) = Neutral 4 (N) = Disagree 5 (D) = Strongly Disagree (SD and Weighted Average = 3.5532

Determination of effective waste collection practice showed that most household solid wastes were managed by self-collection practice having the highest response with mean of 4.2821 and standard deviation of 3.4910. This is contrary to the findings of [17] who evaluated the social, economic and environmental assessment of household solid waste in Mbale city in Uganda. The findings indicated that few residents used multi-stage waste collection methods. This include the collection of solid waste and transportation to dump sites which was located at parish collection facility using the city trucks. However, on the contrary, Chiroma ward could not have an effective waste collection practice powered by the governmental authority to collect, transport and treat waste as rapidly as possible.

For evaluation of various types of household solid waste, agricultural and food wastes were the most commonly generated in the study area, having a mean of 3.8923 and standard deviation of 3.6494 indicating high response. This finding is similar to that of [18] who studied household sold waste in Gombe town, Nigeria showing that 57.9% of food waste dominated the total quantity of household solid waste. Also, [11] studied solid waste generation in Lafia, revealing that 67.60% of food remains and vegetables where the most generated household solid waste in the area. This was followed by Polythene and plastics which constituted 29.59% of the solid waste composition as reported by the respondents. Agricultural food waste, polythene and plastics were the everyday solid waste composition which was regular consumables in various households across cities of the world.

For determination of most effective household solid waste disposal practice, the results revealed that open dump household waste disposal practice had the most effective response, having a mean of 4.3077 and standard deviation of 3.8938. This is contrary to the findings of [19] who assessed household solid waste disposal practices in Sabon Gari, Zaria. It was found that majority (46.85%) of the households burn the waste, while some (29.73%) pay for the disposal and the least of 23.42% dispose in the open dump. It showed that open dump was the least waste disposal practice in the city of

Sabon Gari, contrary to Chiroma ward where open dump was the highest practice waste disposal practice.

Conclusion

It is noteworthy that in some decades ago, Chiroma ward has continuously experienced intense household solid waste generation due to increased population and urbanization. The study reveals a procedure of household solid waste inquiry in the northern part of Nigeria. Thus, residents of Chiroma ward have resorted to self-help in collecting household solid waste to the dump sites with little support from the government. The investigation has revealed that agricultural and food wastes were the most commonly generated as they pose the challenge of the outbreak of diseases since they are biodegradable materials. Finally, the study has unfolded that open dump has the most effective household solid waste disposal practice which has high capacity to cause serious environmental degradation in Chiroma ward, Nassarawa State, Nigeria. First, the government should endeavor to evenly distribute waste dump sites across the space of Chiroma ward with the view to make dump sites closer to the people. Second, multi-waste collection practice should be adopted in Chiroma ward with the view to intensify the services of door-to-door collectors thereby accelerating the rapid evacuation of waste in the study area. Third, private and public sectors should be engaged to reduce, reuse and recycle household solid wastes in order to promote sustainable waste management practice in Chiroma ward. Forth, open dump and other household solid waste mismanagement practices should be discouraged by government enforcing the law of Polluter Pay Principle (PPP) in order to promote healthy and sustainable environment in Chiroma ward.

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