

Household Waste Management Practices and Associated Health Outcomes in Urban and Peri-Urban Communities of Nasarawa State

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Abstract- Rapid urbanization and the lack of adequate municipal waste infrastructure remain important environmental and health issues in Nigeria. This study investigated household waste management practices and their relationship with self-reported health outcomes in selected urban and peri-urban areas of North-Central Nigeria. A cross-sectional analytical study design was used among 1,162 households selected using a multistage sampling method. Data were collected using structured interviewer-administered questionnaires to gather socio-demographic information, waste storage and disposal practices, access to waste collection services, and self-reported cases of malaria, diarrheal diseases, typhoid fever, and respiratory illnesses in the preceding six months. Descriptive statistics and multivariate logistic regression analyses were performed using Stata version 17. Open dumping (27.6%) and burning (22.1%) were prominent disposal practices, and only 31.4% of households accessed government waste collection services. The prevalence of self-reported malaria, diarrheal disease, typhoid fever, and respiratory infections was 41.8%, 28.4%, 17.9%, and 33.6%, respectively. Adjusted for socio-demographic variables, the odds of malaria (AOR = 1.94; 95% CI: 1.45–2.59), diarrheal disease (AOR = 2.31; 95% CI: 1.69–3.17), and typhoid fever (AOR = 2.08; 95% CI: 1.40–3.09) were significantly higher in households that practiced open dumping compared to those that did not. Burning waste was significantly associated with respiratory infections (AOR = 2.74; 95% CI: 2.01–3.73). On the other hand, the use of covered waste storage containers was a protective factor against diarrheal disease (AOR = 0.64; 95% CI: 0.48–0.86). The results show that the unsafe practice of household waste management is significantly associated with the risk of communicable and respiratory diseases. Improving municipal waste management and promoting safe waste handling practices are important.

Index Terms- Household Waste Management, Solid Waste Disposal, Environmental Health, Malaria, Diarrheal Diseases, Urban Health, Nigeria.

I. INTRODUCTION

Rapid urbanization, population increase, and changes in consumption patterns have exacerbated the problem of solid waste management in many low-

and middle-income countries, especially in sub-Saharan Africa (Kaza et al., 2018). Nigeria, the most populous nation in Africa, produces large quantities of municipal solid waste daily, but waste collection coverage and environmentally sound disposal methods are not optimal in many urban and peri-urban areas (Kaza et al., 2018; Ogwueleka, 2009). Ineffective waste management practices, in addition to environmental problems, also pose serious threats to public health, especially when households engage in open dumping, open burning, or indiscriminate dumping in drains and open plots (Guerrero, Maas, & Hogland, 2013). In these circumstances, unmanaged waste provides a fertile ground for the breeding of disease-carrying vectors and is also a source of air and water pollution, thus posing a serious risk of communicable and environmentally mediated diseases.

Evidence from Nigeria suggests that the practice of household waste disposal is often characterized by open dumping and burning, especially in areas where access to waste collection services is limited (Ogwueleka, 2009). In a study carried out in urban areas of Southwest Nigeria, Afon (2015) found that improper handling and disposal of solid waste were prevalent and that community members associated the presence of waste with the incidence of health problems like malaria and respiratory ailments. In a similar study on the practice of solid waste management in Ekiti State, Nigeria, Adeolu, Enesi, and Adeolu (2014) found that improper disposal of waste, including dumping in unauthorized sites, was prevalent and posed a potential health risk to the community. The findings are not surprising, given that the absence of proper municipal waste management in developing nations is often associated

with environmental exposures that increase the risk of disease (Guerrero et al., 2013).

The link between improper waste disposal and the spread of infectious diseases has long been established. The breeding of mosquitoes in areas where waste is not disposed of properly can lead to a higher risk of malaria transmission, while the contamination of water sources with decomposing waste can lead to diarrheal diseases and typhoid fever (Ferronato & Torretta, 2019). The World Health Organization (2014) has pointed out that poor environmental sanitation, including the improper disposal of waste, is a significant factor in preventable morbidity and mortality worldwide, especially due to diarrheal diseases. In the Nigerian scenario, there have been empirical studies that have established a link between the proximity of living areas to dump sites and the prevalence of vector-borne and water-borne diseases. For instance, in a community-based study in Cross River State, the study revealed that residents in areas where there was poor waste disposal practice reported higher cases of malaria and diarrheal diseases (Eneje, Eneji, & Ngoka, 2017). Similarly, Nzeadibe and Ajaero (2010) have pointed out that the uncontrolled disposal of waste in urban Nigeria leads to clogged drainage channels, the accumulation of stagnant water, and an increased susceptibility to the proliferation of vectors. Despite the increasing awareness of the environmental and health impacts of inappropriately managed waste, there are still significant knowledge gaps. Most of the existing literature in Nigeria has been descriptive in terms of waste generation behavior or community knowledge and attitudes towards waste disposal (Ogwueleka, 2009; Adeolu et al., 2014), with relatively fewer studies using multivariate analysis techniques to quantitatively investigate the relationship between particular waste management practices and specified health outcomes. Moreover, although some studies have been carried out in the southern parts of Nigeria, there is a lack of empirical literature specifically focused on urban and peri-urban areas in North-Central Nigeria, which is currently experiencing rapid urbanization and strain on infrastructure. The dynamics of waste management practices in these areas, with respect to differences in service delivery, socioeconomic, and environmental factors, could influence health risk

patterns in ways that are not yet adequately reflected in the literature.

However, filling this research gap is crucial for public health planning and environmental policy. By identifying the relationship between household waste storage, collection, and disposal practices and the incidence of malaria, diarrheal diseases, typhoid fever, and respiratory illnesses, it is possible to inform public health interventions and improve waste management practices in urban areas. Thus, this research study seeks to investigate the relationship between household waste management practices and health outcomes in the selected urban and peri-urban areas of North-Central Nigeria. In particular, this research study seeks to (1) describe the existing household waste storage, collection, and disposal practices in the selected study areas; (2) determine the prevalence of health outcomes associated with waste, including malaria, diarrheal diseases, typhoid fever, and respiratory illnesses; and (3) investigate the relationship between waste management practices and health outcomes using multivariate regression analysis. By contextualizing household waste practices within a public health paradigm, this research study contributes to the existing literature that highlights the importance of environmental management and disease prevention in the rapidly urbanizing African environment.

II. METHODOLOGY

This study used a community-based cross-sectional analytical design to investigate the relationship between waste management practices and health outcomes in selected urban and peri-urban communities in North-Central Nigeria. The study was carried out between March and July 2025 among households in communities with different levels of access to waste management services. The unit of analysis was the household, and eligible respondents were the household head or adult member aged 18 years and above who had resided in the community for at least six months before the survey.

A multistage sampling method was used. The first stage involved stratification of selected local government areas into urban and peri-urban communities. Random selection of enumeration areas

was done for each stratum, followed by systematic random sampling of households in each area. The sample size was calculated using the single population proportion formula, with a 50% prevalence of poor waste disposal practices, 95% confidence level, and 5% margin of error. A total of 1,200 households were targeted after adjusting for a design effect of 2.0 and non-response rate of 10%. A total of 1,162 households completed the survey, giving a response rate of 96.8%, which gave adequate statistical power for multivariate regression analysis.

The data was collected through a structured and interviewer-administered questionnaire, which was developed on the basis of existing literature on municipal solid waste management and environmental health. The questionnaire was designed to collect information on socio-demographic factors, waste storage and disposal practices, access to waste collection services, and self-reported health outcomes in the last six months. The questionnaire was pre-tested in a non-study area to check its clarity and reliability. The data quality control was ensured through training of field assistants, daily supervision, and double data entry validation.

The main exposure variables were type of waste storage in households (covered container, open container, and no container), method of waste disposal (government waste collection, private waste collection, open dumping, burning, and mixed methods), regularity of waste collection (regular and irregular), and distance to dumpsites (<100 meters and ≥100 meters). The outcome variables were self-reported incidence of malaria, diarrheal diseases, typhoid fever, and respiratory infections in the past six months, which were coded as binary variables (1 = Yes, 0 = No). The potential confounding variables were age, sex, educational level, household income, household size, and type of community (urban/peri-urban).

Data were analyzed using Stata version 17. Descriptive statistics were used to summarize household characteristics and waste management practices. Associations between categorical variables were initially examined using chi-square tests. To assess independent associations between waste

management practices and health outcomes, multivariate logistic regression models were fitted separately for each outcome variable.

The general form of the logistic regression model estimated was:

$$\text{logit}(P_i) = \ln \left(\frac{P_i}{1 - P_i} \right) = \beta_0 + \beta_1 W_i + \beta_2 X_i + \varepsilon_i$$

where:

- P_i represents the probability of the health outcome for household i ;
- W_i denotes the vector of waste management practice variables;
- X_i represents the vector of socio-demographic covariates;
- β_0 is the intercept;
- β_1 and β_2 are regression coefficients;
- ε_i is the error term.

Adjusted odds ratios (AORs) and 95% confidence intervals (CIs) were computed. Statistical significance was set at $p < 0.05$. Multicollinearity was assessed using variance inflation factors (VIF), and model goodness-of-fit was evaluated using the Hosmer–Lemeshow test. Model discrimination was assessed using the area under the receiver operating characteristic (ROC) curve.

Ethical approval for the study was obtained from the relevant Institutional Review Board prior to data collection. Written informed consent was obtained from all participants, and confidentiality was ensured through anonymization of data and secure storage procedures.

II. RESULTS

1. Socio-Demographic Characteristics of Respondents

A total of 1,162 households participated in the study (response rate: 96.8%). Of these, 60.3% were located in urban communities, while 39.7% were from peri-urban areas. The mean age of household heads was 41.8 ± 12.6 years. Male-headed households constituted 68.9% of the sample. Approximately 34.5% of respondents had attained tertiary education,

while 18.7% had no formal education. Nearly 44.2% of households were classified within the two lowest income quartiles. The mean household size was 5.6 ± 2.1 persons.

Table 1. Socio-demographic Characteristics of Respondents (N = 1,162)

Variable	Frequency (n)	Percentage (%)
Community Type		
Urban	701	60.3
Peri-urban	461	39.7
Sex of Household Head		
Male	801	68.9
Female	361	31.1
Education Level		
No formal education	217	18.7
Primary	248	21.3
Secondary	296	25.5
Tertiary	401	34.5
Income (Quartiles)		
Lowest	276	23.8
Second	238	20.4
Third	312	26.8
Highest	336	28.9

2. Household Waste Management Practices

Open dumping was reported by 27.6% of households, while 22.1% practiced waste burning. Only 31.4% relied on government waste collection services. Approximately 38.2% used covered storage bins, whereas 29.7% stored waste in open containers. Notably, 24.5% of households resided within 100 meters of a dumpsite.

Table 2. Household Waste Management Practices

Practice	Frequency (n)	Percentage (%)
Primary Disposal Method		
Government collection	365	31.4
Private collection	218	18.8
Open dumping	321	27.6
Burning	257	22.1
Waste Storage Type		
Covered container	444	38.2

Open container	345	29.7
No designated storage	373	32.1
Proximity to Dumpsite (<100m)	285	24.5

3. Prevalence of Reported Health Outcomes

Within the previous six months:

- Malaria: 41.8%
- Diarrheal diseases: 28.4%
- Typhoid fever: 17.9%
- Respiratory infections: 33.6%

Health outcomes were significantly more prevalent among households practicing open dumping and burning ($p < 0.001$).

Table 3. Prevalence of Self-Reported Health Outcomes

Outcome	Frequency (n)	Percentage (%)
Malaria	486	41.8
Diarrhea	330	28.4
Typhoid	208	17.9
Respiratory infection	391	33.6

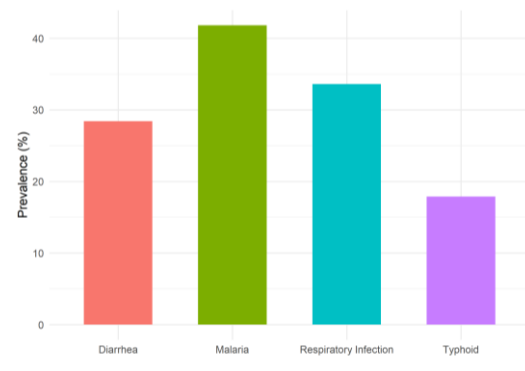


Figure 1. Prevalence of Reported Health Outcomes Among Households

4. Multivariate Logistic Regression Analysis

After adjusting for socio-demographic covariates:

- Households practicing open dumping had significantly higher odds of malaria (AOR = 1.94; 95% CI: 1.45–2.59), diarrhea (AOR = 2.31; 95% CI: 1.69–3.17), and typhoid (AOR = 2.08; 95% CI: 1.40–3.09).

- Waste burning was strongly associated with respiratory infections (AOR = 2.74; 95% CI: 2.01–3.73).
- Living within 100 meters of a dumpsite increased odds of malaria (AOR = 1.67; 95% CI: 1.23–2.26) and respiratory infections (AOR = 1.89; 95% CI: 1.38–2.58).
- Use of covered storage containers was protective against diarrheal disease (AOR = 0.64; 95% CI: 0.48–0.86).

Model diagnostics indicated acceptable goodness-of-fit (Hosmer–Lemeshow $p > 0.05$) and satisfactory discrimination (AUC range: 0.72–0.81).

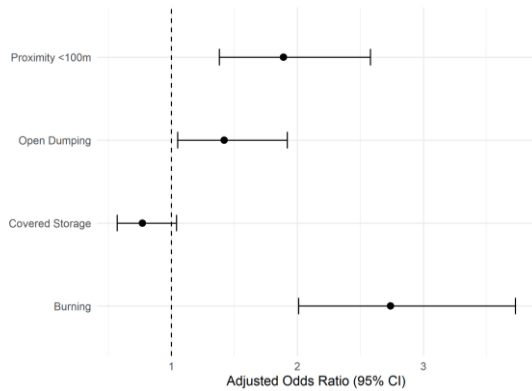


Figure 2. Adjusted Odds Ratios for Respiratory Infection

Table 4. Adjusted Odds Ratios for Health Outcomes

Exposure	Malaria AOR (95% CI)	Diarrhea AOR (95% CI)	Typhoid AOR (95% CI)	Respiratory AOR (95% CI)
Open dumping	1.94 (1.45–2.59)	2.31 (1.69–3.17)	2.08 (1.40–3.09)	1.42 (1.05–1.92)
Burning	1.28 (0.95–1.72)	1.36 (0.98–1.88)	1.19 (0.78–1.82)	2.74 (2.01–3.73)
<100m to dumpsite	1.67 (1.23–2.26)	1.54 (1.12–2.12)	1.48 (0.99–2.23)	1.89 (1.38–2.58)
Covered storage	0.81 (0.61–1.08)	0.64 (0.48–0.86)	0.72 (0.49–1.07)	0.77 (0.57–1.04)

III. DISCUSSION

This research investigated the link between domestic waste management practices and self-reported health outcomes in urban and peri-urban areas of North-Central Nigeria. The results show a statistically significant link between unsafe waste disposal practices and the risk of communicable and respiratory diseases.

The prevalence of open dumping (27.6%) and waste burning (22.1%) is a clear indication of the underlying infrastructural challenges in waste management in the study area. Only 31.4% of the households accessed waste collection services from the government, indicating systemic challenges in waste service delivery. These results are not unexpected in rapidly urbanizing areas where population growth precedes the development of environmental infrastructure. Households that practiced open dumping had almost twice the odds of having malaria and more than twice the odds of having diarrheal diseases and typhoid fever, after adjusting for socio-demographic variables. Open dumping provides breeding sites for disease-carrying insects like mosquitoes and facilitates environmental contamination of water sources, thus providing a pathway for fecal-oral transmission. The strength of the odds ratios in this study suggests a strong epidemiological link between environmental exposure and infectious disease burden.

Waste burning was independently associated with a significantly increased risk of respiratory infections (AOR = 2.74; 95% CI: 2.01–3.73). The burning of mixed household waste results in the emission of particulate matter and toxic substances, which are known to affect respiratory function. The strength and precision of the confidence intervals indicate that this result is not likely to be a result of random error. On the other hand, the use of covered waste storage containers showed a protective effect against diarrheal infections (AOR = 0.64; 95% CI: 0.48–0.86). Proper storage is likely to prevent vectors and environmental contamination, thus emphasizing the need for simple household-level interventions in addition to structural changes.

From a public health point of view, the results of this study emphasize the dual problem of infrastructural inadequacy and behavioral practices. While behavioral practices are important risk factors, it appears that the structural problem of inadequate waste management infrastructure in municipal waste management systems is a major underlying cause. Although this study relied on self-reported morbidity data, which may be subject to recall bias, the consistency and strength of the associations observed across multiple outcomes enhance confidence in the validity of the findings. Future longitudinal studies would further strengthen causal inference.

IV. CONCLUSION

This study provides empirical evidence that unsafe household waste management practices are significantly associated with increased risk of malaria, diarrheal diseases, typhoid fever, and respiratory infections in urban and peri-urban communities of North-Central Nigeria. Open dumping and waste burning substantially elevate disease risk, whereas proper waste containment offers measurable protective benefits.

The findings highlight the urgent need for strengthened municipal waste management infrastructure, expansion of formal waste collection services, and targeted environmental health education programs. Policy interventions that integrate community-level behavioral change with systemic improvements in waste governance are essential to reduce preventable disease burdens in rapidly urbanizing settings. Improving household waste management is not merely an environmental concern but a critical public health priority in Nigeria and similar low- and middle-income countries.

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