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ENVIRONMENTAL AND HEALTH IMPACTS OF PLASTIC BAGS: AWARENESS AND MANAGEMENT PRACTICES IN KADUNA METROPOLIS, NIGERIA

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ABSTRACT

The surge in plastic usage has led to an increase in plastic waste, creating complex environmental, health, and socio-economic challenges, including in developing nations. This study focuses on Kaduna Metropolis, North Western Nigeria, to assess the awareness and management practices surrounding plastic bag waste. It examines the demographic and socio-economic factors influencing these practices while highlighting the prevalence of unsustainable methods such as open dumping and burning, which exacerbate environmental degradation and health risks.Findings reveal that Gender, a ge, marital status, and education significantly impact waste management behaviors. Women, despite limited roles in decision-making, are central to domestic waste disposal, while younger and middle-aged adults dominate waste-related activities. The study also underscores the high prevalence of food and plastic waste, pointing to the urgent need for targeted strategies to promote sustainable practices.Recommendations emphasize public education campaigns tailored to community demographics, the development of adequate waste management infrastructure, policy enforcement to discourage harmful practices, and community based initiatives involving professionals and students. Collaboration with educational institutions to integrate waste management into curricula is identified as a critical long-term strategy. The research offers actionable insights for addressing the pressing issues of plastic pollution and fostering sustainable waste management behaviors in urban settings.

Keywords: Plastic Bags, Environmental, Health Impacts, Awareness and Practice, Kaduna

INTRODUCTION

The escalating utilization of plastics has led to a corresponding surge in plastic waste, posing complicated financial, ecological, and societal challenges (Shehu et al., 2020; Kumar, et al., 2021; Tadama et al., 2022). The non-biodegradable nature of plastics exacerbates their environmental threat, as they persist in the environment for extended periods (Aidonojie et al., 2024). Improper disposal of plastics results in their accumulation in urban areas, obstructing sewage systems, endangering wildlife, contaminating soil, and diminishing the aesthetic appeal of water bodies and coastlines (Ajiba et al., 2024). Particularly in developing nations across Africa, the proliferation of single-use plastic packaging has witnessed a dramatic upsurge in recent decades (Dey et al., 2024). The ramifications of plastic pollution extend beyond an ordinary environmental concern, encompassing detrimental effects on ecological balance, human health, aquatic and terrestrial ecosystems, and marine biodiversity (Dumbili & Henderson, 2020; Islam et al., 2024).

Plastic pollution is a serious global environmental and health issue. Poor plastic waste management, from manufacturing processes to products' end life, poses serious risks to the environment and human health (Islam et al., 2024). Most plastic materials discarded, disposed of, or abandoned in terrestrial environments after a single use "leak" into aquatic ecosystems, killing thousands of marine creatures (Dey et al., 2024). Alarming images of fish, sea birds, turtles, and marine mammals entangled in, suffocated by, or dead from ingesting plastic debris (Pilapitiya & Ratnayake, 2024) underscore the severity of the issue. On land, plastic pollution manifests in various ways such as the deterioration of the natural beauty of the environment, blockage of drainage systems, reduced percolation of water and aeration in soils, and the death of domestic and wild animals due to the ingestion of plastic litter (Shehu et al., 2024; Islam et al., 2024; Pilapitiya & Ratnayake, 2024).

In Nigeria, plastic pollution is a growing concern, with improper disposal leading to clogged drainage systems, flooding, and health hazards (Shehu et al., 2020; Abdullahi & Sokoto, 2023; Ezeudu et al., 2024; Lawal & Shehu,2024). This study focuses on Kaduna Metropolis, North Western Nigeria , to assess the awareness and management practices of plastic bags among its social groups. Understanding local practices and awareness levels, the study aims to propose effective strategies for reducing plastic pollution and its associated health risks. Plastic bags, while convenient, are non-biodegradable, taking up to 2000 years to decompose, and contribute to pollution, wildlife deaths, and greenhouse gas emissions (Earth Eclipse; Hossain et al., 2021)

MATERIALS AND METHODS

This section outlines the nature of the data, data sources, sampling techniques, and methods of data analysis used in the study.

The Study Area

Kaduna, the capital city of Kaduna State and the former political capital of Northern Nigeria, is situated in northwestern Nigeria along the Kaduna River. The city serves as a significant trade center and a major transportation hub, often referred to as the gateway to the northern states of Nigeria, due to its extensive rail and road networks.

According to the 2006 Nigerian census, the population of Kaduna was recorded at 760,084. However, rapid urbanization since 2005 has led to a substantial increase in its population. By 2023, the city's population is estimated to have reached approximately 1.1 million inhabitants according recent report of Kaduna population.

Reconnaissance Survey
A reconnaissance survey was conducted in October 2022 to familiarize with the study area. Spot assessments of economic activities generating plastic waste and visits to local dumpsites were undertaken. Interactions with residents provided preliminary insights into plastic bag waste generation and management practices, shaping subsequent research steps.

Primary Data
Questionnaires were distributed to selected respondents to gather information on awareness, attitudes, and waste management practices, while field observations documented the physical environment and waste disposal methods (Chisanga et al., 2024).

Population and Sample Size
A total of 600 participants from Kaduna metropolis were randomly sampled for this study using a combination of printed questionnaires and Google Forms. The sampling was conducted between February 12 and March 12, 2023, ensuring diverse representation across various demographic categories. This approach aimed to foster inclusivity and minimize bias, allowing individuals from different backgrounds to contribute to the research (Fernandez et al., 2016).

Sampling Methods
Random sampling techniques were employed, with purposive sampling used to select respondents directly relevant to the research topic, and quota sampling ensuring representation across demographic categories such as gender, education, and marital status (Feild et al., 2006).

Research Design
A descriptive research design with a cross-sectional approach was adopted to analyze the current state of plastic bag use and waste management practices, integrating qualitative methods such as in-depth interviews, observations, and textual analysis, alongside quantitative methods involving survey-derived statistical data analyzed using tables.

Methods of Data Collection
Qualitative Methods
The research incorporated interviews using both structured and unstructured questions, with translations provided for non-English speakers

Quantitative Methods
Questionnaires with closed-ended questions were used to gather focused and comprehensive responses, while field data, typically numerical, is analyzed using statistical tools such as tables.

Procedure for Data Collection
The researchers designed and pre-tested interview guides and questionnaires, collecting data through closed-ended questionnaires, personal interviews, field observations, and secondary data reports from relevant institutions.

Method of Data Analysis
The data were analyzed using descriptive statistics for easy interpretation.

Ethical Considerations
Permission was obtained local authorities, while respondents were assured of confidentiality, informed about the study's purpose, and provided informed consent to ensure voluntary participation(Wiles et al., 2007)

Data Presentation, Analysis, and Discussion
This chapter systematically presents and analyzes the data collected and discusses the findings. The subsections include demographic and socio-economic characteristics of the respondents and the types of waste generated in Kaduna metropolis, North Western Nigeria

RESULTS AND DISCUSSION
Demographic and Socio-Economic Characteristics of Respondents
Gender of Respondents
The study analyzed Gender-based differences in waste management participation. Table I reveals that 58% of respondents were male, while 42% were female, out of 600 participants. This disparity may reflect cultural and societal norms in Northern Nigeria, where men are often more involved in formal surveys.
Table 1 indicates that the majority of respondents were male, comprising 58% (n=348) of the sample. Female respondents accounted for 42% (n=252).

Table 1: Gender of Respondents

Gender	No. of Respondents	Percentage (%)
Female	252	42%
Male	348	58%
Total	**600**	**100%**

Age of Respondents
Table 2 shows that 39.2% of respondents were aged 31–40 years, the most represented age group. This age group likely reflects active economic and household engagement, which correlates with greater awareness of waste management practices.
The 21–30 and 41–50 age brackets accounted for 22.3% and 23.5%, respectively. The youngest (15–20 years) and oldest (51+ years) groups were less represented, comprising 8% and 7% of respondents, respectively.

Table 2: Age of Respondents

Age Bracket	No. of Respondents	Percentage (%)
15–20	48	8.0%
21–30	132	22.3%
31–40	240	39.2%
41–50	144	23.5%
51+	36	7.0%
Total	600	100%

Marital Status of Respondents

Table 3 illustrates that most respondents (56%) were married, followed by 24% single, 16% divorced, and 4% separated. This trend aligns with societal norms where the majorities of adults are married and actively participate in household waste management

Table 3: Marital Status of Respondents

Marital Status	No. of Respondents	Percentage (%)
Married	336	56%
Single	144	24%
Divorced	96	16%
Separated	24	4%
Total	600	100%

Total Number of Children

Table 4 highlights that 60% of respondents had 0–5 children, 32% had 6–10 children, and only 8% had more than 10 children. Population size directly affects waste generation, and larger families may generate more waste due to increased consumption.

Table 4: Total Number of Children

Total Number of Children	No. of Respondents	Percentage (%)
0–5	360	60%
6–10	192	32%
11+	48	8%
Total	600	100%

Level of Education

As shown in Table 5, the majority (70%) of respondents had a First Degree or HND, followed by 16% with NCE/OND, and 14% with O'Level qualifications. None of the respondents held a postgraduate degree. This high educational attainment suggests an informed population capable of engaging in sustainable waste management practices.

Table 5: Level of Education

Level of Education	No. of Respondents	Percentage (%)
O'Level	84	14%
NCE/OND	96	16%
First Degree/HND	420	70%
Masters and Above	0	0%
Total	600	100%

Occupation of Respondents

Table 6 shows that 46% of respondents were civil servants, 30% were students, and 24% were traders. These occupations reflect a mix of formal employment, education, and small-scale commercial activities, which influence waste generation and management practices.

Table 6: Occupation of Respondents

Occupation	No. of Respondents	Percentage (%)
Civil Servant	276	46%
Traders	144	24%
Students	180	30%
Others	0	0%
Total	600	100%

Types of Waste Generated

Table 7 identifies the types of waste generated in Kaduna metropolis, North Western Nigeria The majority (48%) was food waste, followed by plastic waste at 36%. Paper waste accounted for 10%, while a combination of food and paper waste made up 6%. The dominance of food waste reflects the residential nature of the areas.

Table 7: Types of Waste Generated

Type of Waste	Percentage (%)
Food Waste	48%
Plastic Waste	36%
Paper Waste	10%
Food and Paper Waste Mix	6%
Total	100%

Techniques Adopted in Waste Management and Related Findings

This section presents the findings related to the techniques used for waste management, agencies responsible for collection, dumpsite availability, awareness of waste control techniques, and the environmental impacts of indiscriminate waste disposal.

Techniques Adopted in Managing Waste

Table 8 reveals that the primary waste management techniques in the study area include open dumping, burning, and burying. Among the respondents, 32% burn their waste, 28% use government-provided bins, 24% dump in open spaces, 8% bury their waste, while only 4% each practice composting or reuse of waste.

The absence of waste sorting before disposal is notable, indicating limited awareness of sustainable waste management practices.

Table 8: Techniques Adopted in Managing Waste

Techniques Used	Frequency	Percentage (%)
Burning	192	32%
Composting	24	4%
Reuse	24	4%
Dump at available site	144	24%
Dumping at government-provided bins	168	28%
Burying	48	8%
Total	600	100%

Agency Responsible for Waste Collection

Table 9 shows that 36% of respondents identified the government as the primary waste collection agency, followed by individuals (28%) and private waste collectors (24%). A smaller fraction (12%) mentioned other waste collection arrangements.

Table 9: Agency Responsible for Waste Collection

Agency	Frequency	Percentage (%)
Government	216	36%
Private Collectors	144	24%
Individuals	168	28%
Others	72	12%
Total	600	100%

Number of Open Dumpsites (Secondary Dumpsites)

Table 10 indicates that 58% of respondents reported only one open dumpsite available for waste disposal, 22% mentioned two dumpsites, and 12% reported four dumpsites. The findings highlight the limited availability of waste disposal sites, particularly for a growing population.

Table 10: Number of Open Dumpsites (Secondary Dumpsites)

Number of Dumpsites	Frequency	Percentage (%)
One	348	58%
Two	132	22%
Three	48	8%
Four	72	12%
Five and above	0	0%
Total	600	100%

Awareness of Artificial Dumpsites

The research also examined awareness of artificially created dumpsites (secondary dumpsites). Table 11 shows that 44% of respondents were unaware of the presence of artificial dumpsites, while 36% confirmed their existence. About 20% had no idea. This gap in awareness contributes to improper waste disposal and accumulation of waste at collection centers.

Table 11: Awareness of Artificial Dumpsites

Awareness	Frequency	Percentage (%)
Yes	216	36%
No	264	44%
No Idea	120	20%
Total	600	100%

Volume of Waste Generated per Week

Table 12 reveals that 46% of respondents generate three buckets or more of waste per week, 24% generate two buckets, 22% generate one bucket, and only 8% generate less than one bucket. This variation aligns with the economic background of the area, divided into a ghetto and a Government Reserved Area (GRA)

Table 12: Volume of Waste Generated per Week

Volume of Waste (per week)	Frequency	Percentage (%)
Half bucket	48	8%
One bucket	132	22%
Two buckets	144	24%
Three and above	276	46%
Total	600	100%

Practice of Source Separation for Plastic Waste

As shown in Table 13, only 20% of respondents practice source separation of plastic waste, while 80% do not separate waste before disposal. This demonstrates a lack of awareness about the environmental benefits of proper waste segregation.

Table 13: Practice of Source Separation for Plastic Waste

Source Separation	Frequency	Percentage (%)
Yes	120	20%
No	480	80%
Total	600	100%

Awareness of Plastic Bag Waste Management Techniques

Table 14 reveals that 60% of respondents were unaware of any waste management techniques, while only 40% were aware. This low awareness level underscores the need for targeted education and advocacy campaigns.

Table 14 Awareness of Plastic Bag Waste Management Techniques

Awareness	Frequency	Percentage (%)
Yes	240	40%
No	360	60%
Total	600	100%

Environmental Impacts of Indiscriminate Waste Disposal

Table 15 highlights the major environmental impacts of improper waste disposal. The most common impact, reported by 38% of respondents, was air pollution caused by burning plastic waste. This was followed by odor and water pollution (36%), flash floods (14%), and traffic congestion from roadside garbage (12%)

Table 15: Environmental Impacts of Indiscriminate Waste Disposal

Environmental Impact	Frequency	Percentage (%)
Flash Floods	84	14%
Air Pollution (burning plastic)	228	38%
Traffic Congestion (roadside waste)	72	12%
Odor and Water Pollution	216	36%
Total	600	100%

Discussion

The findings reveal that demographic factors such as Gender, age, marital status, and education significantly influence waste management practices in Kaduna metropolis North Western Nigeria . Women, though underrepresented, play key roles in domestic waste disposal, while men often dominate decision-making roles. This aligns with the findings of Chiejina and Emesowum (2021), who reported that demographic characteristics significantly impact waste disposal practices. This issue may be linked to the population dynamics and behavioral patterns in Kaduna, which could hinder the effectiveness of waste management programs in the city, despite concerted efforts to improve them by the year 2030 Sylvester & Ikudayisi 2021; Ezeudu et al., 2024)

Younger and middle-aged adults are the most active in waste-related activities, reflecting their responsibilities in households and workplaces. This observation is supported by Komba (2024), who found that age significantly influences waste management practices and health outcomes.

The high prevalence of food and plastic waste highlights the urgent need for targeted waste management strategies, especially in residential areas. Educational attainment among

respondents suggests potential for awareness campaigns to promote sustainable waste disposal methods. Similarly, Vistharakula et al. (2021) emphasized the importance of education in promoting proper waste management practices.

While education is often cited as a key driver of sustainable waste disposal practices, educational attainment alone does not necessarily translate into environmentally responsible behavior. Several studies have indicated that factors such as cultural norms, economic incentives, and local infrastructure play a more significant role than formal education in influencing waste management behavior (Xu et al., 2018; Shehu et al., 2020; Kountouris, 2022).). Therefore, relying solely on educational campaigns may not be sufficient to effect meaningful change in waste disposal practices.

The occupation distribution emphasizes the role of working professionals and students in waste generation, necessitating tailored interventions for different social groups. This is consistent with the findings of Balogun et al. (2020), who highlighted the need for targeted interventions based on occupation.

The findings underscore the predominance of unsustainable waste disposal methods, such as open dumping and burning. Limited access to dumpsites, inadequate awareness of proper waste management, and the absence of sorting practices exacerbate environmental degradation in the area. This is corroborated by the study of Komba (2024), which found that improper waste disposal methods contribute to environmental pollution and health risks.

The data also highlights the urgent need for public education, provision of adequate infrastructure, and enforcement of waste management policies to mitigate the environmental impacts of improper waste disposal. The role of education in waste management is further emphasized by Pushpendra and Kumar (2021), who argued that educational programs are essential for improving waste management practices.

CONCLUSION

This study highlights the significant influence of demographic factors such as Gender, age, marital status, and educational attainment on waste management practices in Kaduna metropolis North Western Nigeria. Women, although underrepresented in decision-making, play critical roles in domestic waste disposal, while younger and middle-aged adults are the most actively involved in waste-related activities. These findings are consistent with existing literature, emphasizing the importance of demographic characteristics in shaping waste management behaviors.

RECOMMENDATIONS

i. Public education and awareness campaigns tailored to the community's demographic profile are essential. These programs should focus on the importance of proper waste disposal and recycling while leveraging the active roles of women and younger adults in waste management.
ii. There is also dire need behavioral change programs towards sustainable waste management practices Kaduna in order reduce improper waste disposal in the state.
iii. Adequate infrastructure, such as dumpsites, waste collection points, and recycling facilities, should be developed and maintained, with an emphasis on encouraging sorting and recycling practices at the household level.
iv. Policy enforcement must be strengthened to discourage unsustainable practices like open dumping and burning by introducing penalties for non-compliance and providing incentives for sustainable practices.
v. Community-based initiatives targeting specific groups, such as working professionals and students, can reduce waste generation and promote sustainable behaviors. These could include workplace recycling programs and school-based waste management clubs.
vi. Collaboration with educational institutions is critical. Schools and universities should integrate waste management into their curricula to foster behavioral change and promote sustainable practices, building a foundation for long-term community transformation.

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