Knowledge, Attitude, and Practice of Solid Waste Management Among Rural and Urban Dwellers in Rivers State, Nigeria

Robinson Tessy Nkechi, Ada Daisy Oguizu, Owhonka Aleruchi*
Department of Public Health Sciences, College of Medical Sciences,
Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria
*Correspondence: orluwenetessy96@gmail.com
DOI: 10.56201/ijgem.vol.11.no10.2025.pg28.45

Abstract
Solid waste management (SWM) is a critical environmental and public health concern, particularly in developing countries where urban-rural disparities affect waste disposal practices. In Nigeria, poor SWM contributes to pollution, flooding, and disease outbreaks, necessitating targeted interventions. The purpose of this study is to assess the knowledge, attitude and practice of solid waste management among rural and urban dwellers in Rivers State, Nigeria. A cross-sectional survey was conducted among 422 respondents (211 rural, 211 urban) who were recruited using a multi-stage sampling method. The data was collected using a structured validated interviewer-administered questionnaire while the data analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics was used to derive frequencies and percentages while the level of statistical significance was set as $P < 0.05$.The findings indicate that majority of the respondents were <30 years (40.0%), females (52.4%), single (51.2%), educated to tertiary level (54.5%), self-employed (42.9%), earns <70,000 NGN monthly (24.6%), lived in nuclear family (79.7%), had a household size of 2-4 persons (52.6%), lived in the area for 2-4 years (33.3%) and lived in a flat (44.4%). This result also showed a clear urban-rural divide in SWM. Urban dwellers exhibit better knowledge and structured waste disposal practices, benefiting from higher education levels and access to formal waste collection services. In contrast, rural dwellers rely more on informal disposal methods such as open burning and indiscriminate dumping due to limited infrastructure. Regression analysis identified household size, education, and income as significant determinants of solid waste management knowledge and practice.

Keywords: *Knowledge, Attitude, Practice, Waste Management, Rural dwellers, Urban dwellers, Rivers State.*

Introduction

Waste management is a multifaceted issue with significant implications for public health, environmental sustainability, and socio-economic development (Ferronato, and Torretta, 2019). According to global waste management market report, it is estimated that about 2.3 to 3.1 billion tonnes of hazardous and other wastes were generated in 2019 (United Nations Environment Programme, 2020). In Nigeria, particularly in Rivers State, the challenges associated with waste management are exacerbated by rapid urbanization, population growth, and inadequate infrastructure (Oyedotun *et al*., 2017).

Solid waste management entails ensuring the reduction of waste (reduce), reusing of goods that can still be used (reuse), recycling and converting waste to energy, thereby maintaining a good

environmental condition. Inappropriate waste handling practices and inadequate provision of solid waste facilities results in indiscriminate disposal and unsanitary environment that pose a threat to the health of residents (Oyedotun *et al*., 2017). Improper handlings, storage and disposal of wastes are the major causes of environmental pollution, which provide a breeding ground for pathogenic organisms and encourages the spread of infectious diseases. The existence of humans makes it unavoidable to generate waste whether it is solid, liquid or gas. Both rural and urban areas face distinct challenges in waste management, including inadequate waste collection systems, improper disposal methods, and limited awareness of the importance of proper waste management practices (Anubi and Elemile, 2019).

There is lack of comprehensive understanding among rural and urban dwellers in Rivers state regarding proper waste management practices including segregation, recycling, and safe disposal methods (Elenwo, 2015). Diverse and sufficient studies have been done on the topic of knowledge, attitude and practice of solid waste management among urban dwellers in Rivers State, but there is paucity of information on that of rural dwellers. In addition, the difference in the knowledge, attitude and practice of solid waste management among rural and urban dwellers has not been ascertained. This study aims to fill this gap in existing literature by comparing the level of knowledge, attitude and practice of solid waste management between rural and urban dwellers.

Methods

Study setting

Two local government areas (Obio/Akpor and Emohua) of Rivers state, was used as the study area for this research.

Study Design and Study Population

This study adopted the use of a cross-sectional design. The target population for this study consists of male and female adults (18 years and above) living in both rural and urban areas of Rivers State.

Sample size and Sampling Techniques

The calculated sample size of 422 (minimum sample size of 372 plus 10% for non-response) was estimated using the Leslie Kish formula for Comparing two groups. A multi-stage sampling method was used to facilitate the selection process of the participants for this study. Simple random sampling for selecting the Local Government Areas (Obio/Akpor and Emohua). A simple random sampling technique was used to select 3 wards from each of the L.G.A, using the lottery method, Resulting in a total of six (6) wards. simple random sampling by lottery method was used to select 2 communities each from the six (6) selected wards. Hence a total of 12 communities selected, systematic sampling technique was used to select 35 households from each community and the respondents were selected using simple random sampling techniques.

Data collection instruments and procedures

A structured validated interviewer-administered questionnaire was used in collecting the data for the study. The questionnaire was made up of part A-D. Part A collected information on the socio-demographic and economic details of the respondents. Part B-D was used in collecting information regarding the knowledge, attitude and practice of solid waste management among the respondents.

The validity of the instrument was achieved by reviewing existing literature, consulting experts in the field and pilot- testing the questionnaire with a small sample of respondents. The questions were clear, understandable and relevant to the target population. This was assessed by obtaining feedback from individuals similar to the target respondents regarding the clarity and appropriateness of the questionnaire.

Statistical analysis

Data was analysed using the statistical package for social sciences (SPSS) version 25. Descriptive statistics was used to derive frequencies and percentages for the sociodemographic characteristics. The section on the knowledge, attitude and practice of solid waste management was scored using the correct answers to the questions as provided by the respondents.

Results

Socio-demographic Characteristics of Rural and Urban Dwellers

Table 1 below outlines the socio-demographic profiles of 422 respondents, equally divided between rural and urban areas. The data reveal significant disparities in age distribution, with urban areas having a higher proportion of younger individuals (<30 years) compared to rural areas, where the 30–44 age group predominates. According to the result, a considerable proportion of urban residents (55.9%) are under 30 years old, compared to only 24.2% in rural areas. Gender distribution is relatively balanced across both regions, with a slight majority of females in urban areas (53.1%). Marital status data indicate that urban dwellers are more likely to be single (65.4%), while rural residents have higher rates of marriage (38.4%), divorce (8.5%), and widowhood (12.3%). Educational attainment is markedly higher in urban areas, with 88.2% of urban respondents having tertiary education compared to only 20.9% in rural areas. Employment status further highlights this divide, with urban residents more likely to be employed (37.9%) or self-employed (46.0%), whereas rural residents are more engaged in farming or trading (20.4%). Income levels also differ remarkably, with urban dwellers reporting higher monthly incomes. The majority of rural dwellers (49.3%) earn less than N70,000 monthly with 37.9% earning between N70,000-N149,999 monthly. Whereas, the urban dwellers have a more diverse income distribution with 24.4% earning between N150,000-N249,999 monthly and 24.2% earning N400,000 or more monthly. Furthermore, most of the urban residents are from the nuclear family (83.2%) compared to 76.3% of the rural dwellers. At the same time, most of the respondents live in households with a size of 2-4 persons. However, this is slightly more among rural dwellers (34.1%) compared to urban residents (32.4%). The duration of residency data suggests that urban areas have a higher turnover of residents as more of the residents have lived in the area for over 10 years (27.6%). Lastly, more of the respondents reside in flats, with more of them (49.0%) in the urban area and 39.8% in the rural areas.

Table 1 Socio-demographic characteristics of rural and urban dwellers

Variables	Rural N (%)	Urban N (%)	Total N (%)
Age category			
<30 years	51 (24.2)	118 (55.9)	169 (40.0)
30 – 44 years	89 (42.2)	63 (29.9)	152 (36.0)
45 – 59 years	59 (28.0)	24 (11.4)	83 (19.7)
60 – 74 years	8 (3.8)	4 (1.9)	12 (2.8)
≥75 years	4 (1.9)	2 (0.9)	6 (1.4)
Total	**211**	**211**	**422**
Sex			
Male	102 (48.3)	99 (46.9)	201 (47.6)
Female	109 (51.7)	112 (53.1)	221 (52.4)
Total	**211**	**211**	**422**
Marital status			
Single	78 (37.0)	138 (65.4)	216 (51.2)
Married	81 (38.4)	63 (29.9)	144 (34.1)
Divorced	18 (8.5)	4 (1.9)	22 (5.2)
Widowed	26 (12.3)	4 (1.9)	30 (7.1)
Separated	8 (12.3)	2 (0.9)	10 (2.4)
Total	**211**	**211**	**422**
Educational level			
None	11 (5.2)	4 (1.9)	15 (3.6)
Primary	24 (11.4)	2 (0.9)	26 (6.2)
Secondary	132 (62.6)	19 (9.0)	151 (35.8)
Tertiary	44 (20.9)	186 (88.2)	230 (54.5)
Total	**211**	**211**	**422**
Employment status			
Student	32 (15.2)	18 (8.5)	50 (11.8)
Unemployed	6 (2.8)	12 (5.7)	18 (4.3)
Employed	46 (21.8)	80 (37.9)	126 (29.9)
Self-employed	84 (39.8)	97 (46.0)	181 (42.9)
Farmer/Trader	43 (20.4)	4 (1.9)	47 (11.1)
Total	**211**	**211**	**422**
Monthly income (NGN)			
<N70,000	104 (49.3)	42 (19.9)	146 (34.6)
N70,000 – N149,999	80 (37.9)	45 (21.3)	125 (29.6)
N150,000 – N249,999	21 (10.0)	43 (20.4)	64 (15.2)
N250,000 – N399,999	2 (0.9)	25 (11.8)	27 (6.4)
≥N400,000	1 (0.5)	51 (24.2)	52 (12.3)

Table 1 contd.

Variables	Rural N (%)	Urban N (%)	Total N (%)
Type of family			
Nuclear	161 (76.3)	168 (83.2)	329 (79.7)
Extended	50 (23.7)	34 (16.8)	84 (20.3)
Total	**211**	**211**	**422**
Household size			
1 person	24 (11.4)	43 (20.6)	67 (16.0)
2 – 4 persons	128 (60.7)	93 (44.5)	221 (52.6)
5 – 7 persons	48 (22.7)	62 (29.7)	110 (26.2)
≥8 persons	11 (5.2)	11 (5.3)	22 (5.2)
Total	**211**	**211**	**422**
Duration of residency in the area			
≤1 year	8 (3.8)	35 (16.7)	43 (10.2)
2 – 4 years	72 (34.1)	68 (32.4)	140 (33.3)
5 – 7 years	41 (19.4)	35 (16.7)	76 (18.1)
8 – 10 years	38 (18.0)	14 (6.7)	52 (12.4)
>10 years	52 (24.6)	58 (27.6)	110 (26.1)
Total	**211**	**211**	**422**
Type of apartment			
Mud house	4 (1.9)	0 (0.0)	4 (1.0)
Thatched house	2 (0.9)	0 (0.0)	2 (0.5)
Single room	16 (7.6)	7 (3.3)	23 (5.5)
Self-contain	91 (43.1)	43 (20.5)	134 (31.8)
Flat	84 (39.8)	103 (49.0)	187 (44.4)
Duplex	14 (6.6)	44 (21.0)	58 (13.8)
Others	0 (0.0)	13 (6.2)	13 (3.1)
Total	**211**	**211**	**422**

Knowledge of Solid Waste Management among Rural and Urban Dwellers

Table 2 presents the results of the knowledge of SWM practices among respondents. According to the findings, a significant proportion of rural respondents (57.8%) believe that all waste is unwanted or useless, compared to only 23.2% of urban dwellers. Both rural and urban dwellers largely recognize the health risk associated with improper waste disposal, although urban dwellers demonstrate a slightly higher level of awareness (99.1%) compared to the rural dwellers (85.3%) regarding the harmful effects of improper waste disposal. About 87.2% of the rural respondents agreed to the link between waste dumping and flooding while 94.3% of the urban respondents also agreed that dumping wastes improperly can cause flooding. While 23.2% of rural dwellers found dumping refuse on walkways and roads acceptable, only 11.8% of urban dwellers shared this view. The data also showed that 86.7% of rural dwellers, compared to 65.4% of urban dwellers believe that all household waste should be dumped in one container or bag. Both rural (82%) and urban (83.9%) dwellers largely agree that waste sorting at home can reduce the quantity of waste generated for disposal. Similarly, majority of both rural (86.3%) and

urban (91.5%) dwellers recognized that reusing materials can mitigate environmental problems. However, rural residents (80.6%) are believed that open burning is an effective waste disposal method, only 22.3% of urban dwellers shared this opinion. The data also indicate that urban (72.5%) and rural (66.4%) residents support of having nearby disposal sites, with urban residents showing a higher level of support.

Table 2: **Distribution Knowledge of solid waste management practices among rural and urban dwellers**

Items	Rural N (%)	Urban N (%)	Total N (%)
All waste is unwanted or useless			
Yes	122 (57.8)	49 (23.2)	171 (40.5)
No	89 (42.2)	162 (76.8)	251 (59.5)
Total	**211**	**211**	**422**
Improper waste disposal can be harmful for human health			
Yes	180 (85.3)	209 (99.1)	389 (92.2)
No	31 (14.7)	2 (0.9)	33 (7.8)
Total	**211**	**211**	**422**
Dumping waste improperly can cause flooding			
Yes	184 (87.2)	199 (94.3)	383 (90.8)
No	27 (12.8)	12 (5.7)	39 (9.2)
Total	**211**	**211**	**422**
Dumping of refuse on the walkways and along major tarred roads is acceptable			
Yes	49 (23.2)	25 (11.8)	74 (17.5)
No	162 (76.8)	186 (88.2)	348 (82.5)
Total	**211**	**211**	**422**
All wastes generated from the household should be dumped in one container/bag			
Yes	183 (86.7)	138 (65.4)	321 (76.1)
No	28 (13.8)	73 (34.6)	101 (23.9)
Total	**211**	**211**	**422**
Sorting of waste at home before discarding them will reduce quantity of waste generated for disposal			
Yes	173 (82.0)	177 (83.9)	350 (82.9)
No	38 (18.0)	34 (16.1)	72 (17.1)
Total	**211**	**211**	**422**
Waste can be reduced to solve environmental problems by reusing plastic bags, bottles, paper etc.			
Yes	182 (86.3)	193 (91.5)	375 (88.9)
No	29 (13.7)	18 (8.5)	47 (11.1)
Total	**211**	**211**	**422**

Table 2: continued

Open burning is the effective disposal mechanism for household solid waste management			
Yes	170 (80.6)	47.3 (22.3)	217 (54.3)
No	41 (19.4)	164 (77.7)	205 (48.6)
Total	**211**	**211**	**422**
Having disposal sites nearby is encouraged			
Yes	140 (66.4)	153 (72.5)	293 (69.4)
No	71 (33.6)	58 (27.5)	129 (30.6)
Total	**211**	**211**	**422**

Attitudes of rural and urban residents towards solid waste management

Table 3 examines attitudes towards SWM. According to the result, urban residents exhibit a stronger consensus that waste is a pressing environmental issue requiring immediate attention, with 57.3% strongly agreeing compared to 33.6% of rural respondents. While the majority of both rural (43.1%) and urban (40.8%) dwellers reject the idea that local authorities have no role in waste management, they (49.3% and 51.7% of rural and urban residents, respectively) consider waste management as their responsibility and not only that of waste management authorities. A significant proportion of urban (77.7%) residents strongly disagree with dumping of refuse on walkways and along major tarred roads while 51.2% of rural residents also consider it unacceptable. Similarly, the attitude of open burning of waste was also considered unacceptable among urban dwellers (56.4%) and their rural counterparts (42.6%). Furthermore, the consideration of engaging the services of waste collectors as a waste of money was met with stronger disagreement among the urban dwellers (84.4%) in comparison with their rural counterparts (58.3%). Also, more of the urban dwellers (66.5%) disagree that waste separation takes too much time and occupies too much space in comparison with 44.1% of the rural dwellers. Majority of both rural and urban dwellers believe that separation of solid from liquid waste is necessary, with 67.8% of rural dwellers (36.0% strongly disagree + 31.8% disagree) and 84.8% of urban dwellers (38.4% strongly disagree + 46.4% disagree) expressing disagreement or strong disagreement with the notion that separation is not necessary. Also, majority of both rural and urban dwellers believe putting waste into garbage containers is a collective responsibility with 62.6% of rural dwellers (31.3% strongly agree + 31.3% agree) and 93.8% of urban dwellers (50.2% strongly agree + 43.6% agree) express agreement, highlighting a stronger consensus among urban dwellers. About 76.8% of rural dwellers agree that reusing plastic bags for shopping is good for reducing wastes while 77.2% of urban dwellers also agree with the notion.

Table 3: Attitude towards solid waste management among rural and urban dwellers

Items	Rural N (%)	Urban N (%)	Total N (%)
Waste is one of the environmental problems that need immediate attention in the area			
Strongly agree	71 (33.6)	121 (57.3)	192 (45.5)
Agree	90 (42.7)	64 (30.3)	154 (36.5)
Indifferent	6 (2.8)	5 (2.4)	11 (2.6)
Disagree	12 (5.7)	3 (1.4)	15 (3.6)
Strongly disagree	32 (15.2)	18 (8.5)	50 (11.8)
Total	**211**	**211**	**422**
Local authorities have no role to play in household solid waste management			
Strongly disagree	91 (43.1)	86 (40.8)	177 (41.9)
Disagree	47 (22.3)	84 (39.8)	131 (31.0)
Indifferent	17 (8.1)	9 (4.3)	26 (6.2)
Agree	38 (18.0)	19 (9.0)	57 (13.5)
Strongly agree	18 (8.5)	13 (6.2)	31 (7.3)
Total	**211**	**211**	**422**
Waste management is my responsibility and not only that of waste management authorities			
Strongly agree	104 (49.3)	109 (51.7)	213 (50.5)
Agree	53 (25.1)	72 (34.1)	125 (29.6)
Indifferent	8 (3.8)	11 (5.2)	19 (4.5)
Disagree	5 (2.4)	6 (2.8)	11 (2.6)
Strongly disagree	41 (19.4)	13 (6.2)	54 (12.8)
Total	**211**	**211**	**422**
Dumping of refuse on walkways and along major tarred roads is acceptable			
Strongly disagree	108 (51.2)	164 (77.7)	272 (64.5)
Disagree	62 (29.4)	35 (16.6)	97 (23.0)
Indifferent	5 (2.4)	2 (0.9)	7 (1.7)
Agree	23 (10.9)	5 (2.4)	28 (6.6)
Strongly agree	13 (6.2)	5 (2.4)	18 (4.3)
Total	**211**	**211**	**422**
Open burning of refuse is a very efficient means of solid waste management			
Strongly disagree	45 (21.3)	54 (25.6)	99 (23.5)
Disagree	45 (21.3)	65 (30.8)	110 (26.1)
Indifferent	32 (15.2)	21 (10.0)	53 (12.6)
Agree	49 (23.2)	61 (28.9)	110 (26.1)
Strongly agree	40 (19.0)	10 (4.7)	50 (11.8)
Total	**211**	**211**	**422**

Table 3: continued

Items	Rural N (%)	Urban N (%)	Total N (%)
Engaging the services of waste collector is a waste of money			
Strongly disagree	66 (31.3)	86 (40.8)	152 (36.0)
Disagree			
Indifferent	38 (18.0)	14 (6.6)	52 (12.3)
Agree	27 (12.8)	13 (6.2)	40 (9.5)
Strongly agree	23 (10.9)	6 (2.8)	29 (6.9)
Total	**211**	**211**	**422**
Waste separation takes too much time and occupies too much space			
Strongly disagree	46 (21.8)	35 (16.6)	81 (19.2)
Disagree	47 (22.3)	99 (46.9)	146 (34.6)
Indifferent	47 (22.3)	40 (19.0)	87 (20.6)
Agree	44 (20.9)	33 (15.6)	77 (18.2)
Strongly agree	27 (12.8)	4 (1.9)	31 (7.3)
Total	**211**	**211**	**422**
Separation of solid from liquid waste is not necessary			
Strongly disagree	76 (36.0)	81 (38.4)	157 (37.2)
Disagree	67 (31.8)	98 (46.4)	165 (39.1)
Indifferent	22 (10.4)	13 (6.2)	35 (8.3)
Agree	29 (13.7)	15 (7.1)	44 (10.4)
Strongly agree	17 (8.1)	4 (1.9)	21 (5.0)
Total	**211**	**211**	**422**
Putting wastes into garbage containers is the responsibility of everybody			
Strongly agree	96 (31.3)	106 (50.2)	202 (47.9)
Agree	66 (31.3)	92 (43.6)	158 (37.4)
Indifferent	17 (8.1)	2 (0.9)	19 (4.5)
Disagree	17 (8.1)	4 (1.9)	21 (5.0)
Strongly disagree	15 (7.1)	7 (3.3)	22 (5.2)
Total	**211**	**211**	**422**
Reusing plastic bags for shopping is good for reducing waste			
Strongly agree	81 (38.4)	49 (23.2)	130 (30.8)
Agree	81 (38.4)	114 (54.0)	195 (46.2)
Indifferent	14 (6.6)	21 (10.0)	35 (8.3)
Disagree	15 (7.1)	16 (7.6)	31 (7.3)
Strongly disagree	20 (9.5)	11 (5.2)	31 (7.3)
Total	**211**	**211**	**422**

Practice of solid Waste Management among Rural and Urban Dwellers

Table 4 provides a comparative analysis of SWM practices between rural and urban dwellers, revealing stark differences in waste management behaviours. Urban dwellers are more likely to use closed containers for waste collection (74.9%) compared to rural dwellers (61.1%). Food items are the most commonly disposed waste in both rural (77.3%) and urban (91.9%) areas, but urban residents dispose of more plastics (71.6%) and papers (68.2%). Rural dwellers are more likely to throw waste in the nearest container (70.1%), while urban dwellers rely more on formal collection systems, placing waste outside for collection (61.1%). Interestingly, rural dwellers are more likely to segregate waste (78.2%) compared to urban dwellers (65.9%).Among rural dwellers, the most commonly separated waste types are plastic containers (59.2%), glass bottles (47.4%) and waste water (39.8%), whereas urban dwellers prioritize separating glass bottles (64.9%), plastic containers (52.1%) and metals (50.7%). A significantly higher rate of urban dwellers, however, reuse plastic containers (85.8%) compared to the 58.3% of rural dwellers who reuse plastic containers. Rural dwellers on the other hand, commonly reuse papers and cartons (43.1%) and compared to their urban counterparts (27.5%) . Rural areas rely more on dumpsites (51.2%), open burning (36.0%) and landfill sites (20.4%), while urban areas depend on collection agencies (39.8%) and dumpsites (34.1%). Urban dwellers also dispose of waste more frequently, with 17.1% disposing daily compared to 7.6% in rural areas. Although 50.2% of rural dwellers dispose twice weekly compared to 37.0% of rural dwellers. Rural dwellers transport waste to final deposal site personally (38.4%) compared to urban dwellers (28.9%) who do not transport waste personally. The study revealed that 56.4% of rural dwellers primarily use hand carrying method to transport waste to final disposal site, whereas urban dwellers rely more on vehicular transport such as closed trucks (30.8%), open trucks (21.3%) and pickups (15.2%).

Table 4: Distribution of responses on practice of solid waste management among rural and urban dwellers

Items	Rural N (%)	Urban N (%)	Total N (%)
In which ways do you collect household waste**			
In a bag inside a closed container	129 (61.1)	158 (74.9)	287 (32.0)
In a bag inside an open container	49 (23.2)	29 (13.7)	78 (18.5)
Inside an open container	25 (11.8)	4 (1.9)	29 (6.9)
Inside a closed container	14 (6.6)	20 (9.5)	34 (8.1)
Total	**211**	**211**	**422**
Type of waste often disposed			
Food items	163 (77.3)	194 (91.9)	357 (84.6)
Nylon bags	113 (53.6)	7 (3.3)	120 (28.4)
Plastics	111 (52.6)	151 (71.6)	262 (62.1)
Papers	76 (36.0)	144 (68.2)	220 (52.1)
Kitchen waste water	87 (41.2)	117 (55.5)	204 (48.3)
Bottles	57 (27.0)	136 (64.5)	193 (45.7)
Bathroom waste water	54 (25.6)	51 (24.2)	105 (24.9)
Latrine waste water	49 (23.2)	33 (15.6)	82 (19.4)
Textile and clothing	29 (13.7)	70 (33.2)	99 (23.5)
Total	**211**	**211**	**422**

Table 4: continued

Items	Rural N (%)	Urban N (%)	Total N (%)
Throw it in the nearest container	148 (70.1)	106 (50.2)	254 (60.2)
Place it outside for when collectors pass	61 (28.9)	129 (61.1)	190 (45.0)
Place it at a corner in the street when bag is full	10 (4.7)	30 (14.2)	40 (9.5)
Pour it down the drain	4 (1.9)	18 (8.5)	22 (5.2)
Total	**211**	**211**	**422**
Segregate waste before dumping it			
Yes	165 (78.2)	139 (65.9)	304 (72.0)
No	46 (21.8)	72 (34.1)	118 (28.0)
Total	**211**	**211**	**422**
Type of waste often separate from other household wastes			
Plastic containers	125 (59.2)	110 (52.1)	235 (55.7)
Glass bottles	100 (47.4)	137 (64.9)	237 (56.2)
Waste water	84 (39.8)	66 (31.3)	150 (35.5)
Paper and cartons	82 (38.9)	54 (25.6)	136 (32.2)
Metal	55 (26.1)	107 (50.7)	162 (38.4)
Organic materials	48 (22.7)	50 (23.7)	98 (23.2)
Textiles	36 (17.1)	48 (22.7)	84 (19.9)
Batteries	23 (10.9)	60 (28.4)	83 (19.7)
Medical waste	23 (10.9)	45 (21.3)	68 (16.1)
Total	**211**	**211**	**422**
Type of waste usually reuse			
Plastic containers	123 (58.3)	181 (85.8)	304 (72.0)
Paper and cartons	91 (43.1)	58 (27.5)	149 (35.3)
Glass bottles	72 (34.1)	78 (37.0)	150 (64.5)
Computer CDs	61 (28.9)	12 (5.7)	73 (17.3)
Organic materials	46 (21.8)	11 (5.2)	57 (13.5)
Textiles	21 (10.0)	31 (14.7)	52 (12.3)
Total	**211**	**211**	**422**
Current method of disposing waste			
Dumpsites	108 (51.2)	72 (34.1)	180 (42.7)
Open burning	76 (36.0)	16 (7.6)	92 (21.8)
Landfill site	43 (20.4)	8 (3.8)	51 (12.1)
Composting	16 (7.6)	2 (0.9)	18 (4.3)
Incinerator	13 (6.2)	1 (0.5)	14 (3.3)
Use collection agencies	13 (6.2)	84 (39.8)	97 (23.0)
Use of cart pushers	11 (5.2)	30 (14.2)	41 (9.7)
Pour into drainages	3 (1.4)	2 (0.9)	5 (1.2)
Total	**211**	**211**	**422**
Frequency of waste disposal			
Daily	16 (7.6)	36 (17.1)	52 (12.3)
Twice weekly	106 (50.2)	78 (37.0)	184 (43.6)

Weekly	88 (41.7)	87 (41.2)	175 (41.5)
Twice monthly	1 (0.5)	8 (3.8)	9 (2.1)
Monthly	0 (0.0)	2 (0.9)	2 (0.5)
Total	**211**	**211**	**422**
Transport waste to final disposal site personally			
Yes	81 (38.4)	61 (28.9)	142 (33.6)
No	130 (61.6)	150 (71.1)	280 (66.4)
Total	**211**	**211**	**422**
Methods/systems used to transport waste to final disposal sites			
Hand carrying	119 (56.4)	40 (19.0)	159 (37.7)
Closed truck (s)	40 (19.0)	65 (30.8)	105 (24.9)
Wheel barrow	37 (17.5)	14 (6.6)	51 (12.1)
Pick-up	31 (14.7)	32 (15.2)	63 (14.9)
Open truck (s)	30 (14.2)	45 (21.3)	75 (17.8)
Others	1 (0.5)	16 (7.6)	17 (4.0)
Total	**211**	**211**	**422**

Factors Affecting the Practice of Solid Waste Management

The data in Table 5 highlights the interplay between socio-demographic factors and waste management practices among rural and urban dwellers. For the rural dwellers, the data reveal that household size, duration of residency, and type of apartment are statistically significant ($p<0.05$) factors influencing SWM practices. Notably, individuals living in larger households (≥5 persons) and long-term residents (>10 years) showed higher tendencies for poor waste disposal ($p = 0.018$ and $p = 0.0001$, respectively). Also, individuals living in larger households (5–7 persons) are more likely to exhibit poor SWM practices, while those in self-contained apartments or flats show a higher incidence of good waste management, indicating a possible link between private housing and responsible waste disposal ($p = 0.001$). On the other hand, age appears to influence waste management practices, with older individuals (45–59 years) more likely to exhibit poor SWM practice in contrast with younger individuals (<30 years) who tend to show a greater tendency towards good waste management. Furthermore, sex and marital status showed no significant influence on waste management practices, as reflected in the p-values (0.944 and 0.810, respectively). At the same time, educational attainment emerges as a possible determinant, with tertiary education being more common among those exhibiting good practices (33.3% vs. 19.5%), albeit not at a statistically significant level ($p = 0.383$). Additionally, employment status and income levels also appear to impact waste management, with a larger proportion of self-employed individuals (42.1%) demonstrating good practices compared to farmers/traders (17.9%). For the urban dwellers, household size emerged as the only statistically significant factor ($p<0.05$), with larger households (5–7 persons) more likely to exhibit poor SWM practices. Age does not show a strong association ($p = 0.320$), while gender exhibits a marginal association, with males accounting for a disproportionate share of poor practices (77.7%), although this result is not statistically significant ($p = 0.086$). Furthermore, educational attainment appears to influence waste management, with a higher percentage of tertiary-educated individuals engaging in good practices (88.6%). Also, though employment status does not present a significant correlation, self-employed individuals (46.0%) demonstrate a stronger adherence to good waste management than employees (38.1%). Similarly, though residency

duration does not show a strong correlation (p = 0.420), a trend emerges where long-term residents (>10 years) demonstrate a higher incidence of poor waste practices (44.4%). Additionally, housing type also influences waste disposal habits, with poor practices being more common among flat dwellers (66.7%).

Table 5: Socio-Demographic Characteristics and Practice Of Swm Among Rural Dwellers

Variables	Rural Dwellers		Urban Dwellers	
	Poor practice N (%)	**Good practice N (%)**	**Poor practice N (%)**	**Good practice N (%)**
Age category				
<30 years	5 (23.8)	46 (24.2)	4 (44.4)	114 (56.4)
30 – 44 years	5 (23.8)	84 (44.2)	2 (22.2)	61 (30.2)
45 – 59 years	11 (52.4)	48 (25.3)	3 (33.3)	21 (10.4)
60 – 74 years	0 (0.0)	8 (4.2)	0 (0.0)	4 (2.0)
≥75 years	0 (0.0)	4 (2.1)	0 (0.0)	2 (1.0)
Total	**21**	**190**	**9**	**202**
	Fisher's exact test = 6.508; p-value = 0.130		*Fisher's exact test = 4.919; p-value = 0.320*	
Sex				
Male	10 (47.6)	92 (48.8)	7 (77.7)	92 (45.5)
Female	11 (52.4)	98 (51.6)	2 (22.2)	110 (54.5)
Total	**21**	**190**	**9**	**202**
	Chi Square = 0.005; p-value = 0.944		*Fisher's exact p-value = 0.086*	
Marital status				
Single	7 (33.3)	71 (37.4)	5 (55.6)	133 (65.8)
Married	11 (52.4)	70 (36.8)	4 (44.4)	59 (29.2)
Divorced	1 (4.8)	17 (8.9)	0 (0.0)	4 (2.0)
Widowed	2 (9.5)	24 (12.6)	0 (0.0)	4 (2.0)
Separated	0 (0.0)	8 (4.2)	0 (0.0)	2 (1.0)
Total	**21**	**190**	**9**	**202**
	Fisher's exact test = 1.639; p-value = 0.810		*Fisher's exact test = 2.495; p-value = 0.658*	
Educational level				
None	0 (0.0)	11 (5.8)	0 (0.0)	4 (2.0)
Primary	1 (4.8)	23 (12.1)	0 (0.0)	2 (1.0)
Secondary	13 (61.9)	119 (62.6)	2 (22.2)	17 (8.4)
Tertiary	7 (33.3)	37 (19.5)	7 (77.8)	179 (88.6)
Total	**21**	**190**	**9**	**202**
	Fisher's exact test = 2.885; p-value = 0.383		*Fisher's exact test = 3.402; p-value = 0.385*	
Employment status				
Student	4 (19.0)	28 (14.7)	1 (1.1)	17 (8.4)

Unemployed	0 (0.0)	6 (3.2)	0 (0.0)	12 (5.9)
Employee	4 (19.0)	42 (22.1)	3 (33.3)	77 (38.1)
Self-employed	4 (19.0)	80 (42.1)	4 (44.4)	93 (46.0)
Farmer/Trader	9 (42.9)	34 (17.9)	1 (11.1)	3 (1.5)
Total	**21**	**190**	**9**	**202**
	Fisher's exact test = 8.098; p-value = 0.070		*Fisher's exact test = 4.156; p-value = 0.347*	
Monthly income (NGN)				
<70,000	11 (52.4)	93 (48.9)	2 (22.2)	40 (19.8)
70,000 – 149,999	7 (33.3)	73 (38.4)	2 (22.2)	43 (21.3)
150,000 – 249,999	3 (14.3)	18 (9.5)	3 (33.3)	40 (19.8)
250,000 – 399,999	0 (0.0)	2 (1.1)	0 (0.0)	25 (12.4)
≥400,000	0 (0.0)	1 (0.5)	2 (22.2)	49 (24.3)
No income/not specified	0 (0.0)	3 (1.6)	0 (0.0)	5 (2.5)
Total	**21**	**190**	**9**	**202**
	Fisher's exact test = 2.099; p-value = 0.826		*Fisher's exact test = 2.017; p-value = 0.870*	
Nuclear	15 (71.4)	145 (76.8)	8 (88.9)	169 (83.7)
Extended	6 (28.6)	44 (23.2)	1 (11.1)	33 (16.3)
Total	**21**	**190**	**9**	**202**
	Fisher's exact p-value = 0.592		*Fisher's exact p-value = 1.000*	
Household size				
1 person	1 (4.8)	23 (12.1)	0 (0.0)	43 (21.3)
2 – 4 persons	8 (38.1)	120 (63.2)	1 (11.1)	94 (46.5)
5 – 7 persons	10 (47.6)	38 (20.0)	6 (66.7)	56 (27.7)
≥8 persons	2 (9.5)	9 (4.7)	2 (22.2)	9 (4.5)
Total	**21**	**190**	**9**	**202**
	Fisher's exact test = 9.185; p-value = 0.018*			
Duration of residency in the area				
≤1 year	**0 (0.0)**	8 (4.2)	1 (11.1)	34 (16.8)
2 – 4 years	1 (4.8)	71 (37.4)	1 (11.1)	68 (33.7)
5 – 7 years	5 (23.8)	36 (18.9)	2 (22.2)	33 (16.3)
8 – 10 years	2 (9.5)	36 (18.9)	1 (11.1)	13 (6.4)
>10 years	13 (61.9)	39 (20.5)	4 (44.4)	54 (26.7)
Total	**21**	**190**	**9**	**202**
	Fisher's exact test = 18.878; p-value = 0.0001*		***Fisher's exact test = 11.986; p-value = 0.003****	
Type of apartment				

Mud house	0 (0.0)	4 (2.1)	0 (0.0)	7 (3.5)
Thatched house	0 (0.0)	2 (1.1)	1 (11.1)	42 (20.8)
Single room	0 (0.0)	16 (8.4)	6 (66.7)	98 (48.5)
Self-contain	2 (9.5)	89 (46.8)	1 (11.1)	43 (21.3)
Flat	17 (81.0)	67 (35.3)	1 (11.1)	12 (5.9)
Duplex	2 (9.5)	12 (6.3)	0 (0.0)	7 (3.5)
Total	**21**	**190**	**9**	**202**
	Fisher's exact test = 17.929; p-value = 0.001*	*Fisher's exact test = 1.975; p-value = 0.688*		

*Statistically significant

Comparison of the level of knowledge, attitude and practice (KAP) of solid waste management between rural and urban dwellers

The table provides a comparative analysis of KAP levels. According to the result, urban dwellers exhibit significantly better knowledge, attitudes, and practices compared to rural residents, with statistically significant differences. The proportion of individuals with good knowledge is nearly twice as high in urban areas (28.9% vs 13.7%), reinforcing the role of education and exposure. Attitudinal differences are striking, with only 1.9% of urban respondents displaying poor attitudes compared to 24.2% of rural dwellers ($p < 0.0001$). While waste management practices are generally good across both groups, urban residents demonstrate a higher compliance rate (95.7% vs 90.0%, $p = 0.023$).

Table 6: Level of knowledge, attitude and practice of solid waste management among rural and urban dwellers

Variables	**Rural N = 211 n (%)**	**Urban N = 211 n (%)**	**Total N = 422 n (%)**
Level of knowledge on solid waste management			
Poor	74 (35.1)	33 (15.6)	107 (25.4)
Fair	108 (51.2)	117 (55.5)	225 (53.3)
Good	29 (13.7)	61 (28.9)	90 (21.3)
	Chi Square = 27.448; p-value = 0.0001*		
Level of attitude on solid waste management			
Poor	51 (24.2)	4 (1.9)	55 (13.0)
Good	160 (75.8)	207 (98.1)	367 (87.0)
	Chi Square = 46.183; p-value = 0.0001*		
Level of practice of solid waste management			
Poor	21 (10.0)	9 (4.3)	30 (7.1)
Good	190 (90.0)	202 (95.7)	392 (92.9)
	Chi Square = 5.167; p-value = 0.023*		
Chi Square = 22.061; p-value = 0.0001		*Statistically significant	

Multiple logistic regression showing factors associated with poor practice of solid waste management among rural dwellers in Rivers State

The table reinforces factors associated with poor SWM practices through logistic regression analysis, confirming that household size and type of apartment are significant predictors of poor SWM practices in rural areas. The odds of poor practices are nearly three times higher in households with five or more members and almost 10 times higher in flats or duplexes.

Table 7: Multiple logistic regression showing factors associated with poor practice of solid waste management among rural dwellers in Rivers State

Factors (N = 211)	Coefficient (B)	Adjusted Odds ratio (OR)	95% CI	p value
Household size				
≥5 persons	1.034	2.811	1.05 – 7.51	**0.039***
≤4 persons [R]		1		
Duration of residency in the area				
≥7 years	0.565	1.760	0.60 – 5.13	0.300
<7 years [R]		1		
Type of apartment				
Flat/Duplex	2.278	9.755	2.13 – 44.75	**0.003***
Self-contained/Others [R]		1		

*Statistically significant ($p<0.05$)

1. Discussion

Knowledge of Solid Waste Management Practices among Rural and Urban Dwellers

The result showed that urban residents demonstrate better knowledge of SWM practices, though misconceptions exist in both groups, particularly among rural dwellers, especially regarding waste categorisation and segregation as they are more likely to view all waste as useless and endorse open burning as a disposal method. This finding is consistent with that of Akinola *et al.* (2020) in Lagos State, who found that urban residents had higher awareness of waste segregation and recycling practices compared to rural residents, attributing this to greater access to education, waste management infrastructure, and public awareness campaigns in urban areas. Similarly, the study of Miezah *et al*. (2015) in Ghana found that urban dwellers had higher awareness of waste segregation and recycling practices compared to rural residents, attributing this to greater access to education, waste management infrastructure, and public awareness campaigns in urban areas.

Attitudes of Rural and Urban Residents towards Solid Waste Management

Urban residents exhibit more proactive attitudes towards SWM, recognising waste as a pressing issue and demonstrating a stronger rejection of improper disposal practices and a greater inclination to engage waste collectors. The rural residents on the other hand are more accepting of practices like open burning, reflecting limited access to alternatives and lower environmental awareness. Similar to this finding, the study of Eja and Arikpo (2011) which was conducted in Calabar, Nigeria to assess urban dwellers' attitudes towards waste disposal and management revealed that environmental enlightenment significantly influenced waste generation and management practices, suggesting that increased awareness leads to more proactive attitudes

towards SWM among urban residents.

Practice of Solid Waste Management in both Rural and Urban Dwellers

Urban dwellers follow more structured waste disposal practices, such as using closed containers and formal disposal methods, while rural residents rely more on informal methods like open burning and local dumping, highlighting the urban-rural divide in access to waste management infrastructure and behavioural challenges. Similarly, the study conducted by Oluwafemi *et al.* (2020) in Oyo State revealed that urban residents were more likely to use formal waste disposal methods, such as government-provided waste bins and collection services, compared to rural residents who relied on open dumping and burning.

Factors Affecting the Practice of Solid Waste Management

The interplay between socio-demographic factors and waste management practices as analysed in this study revealed that household size, duration of residency, and type of apartment were the statistically significant ($p<0.05$) factors influencing SWM practices among rural dwellers while it was only household size among the urban residents. Similarly, Oluwafemi *et al.* (2020) found that larger households in Lagos, Nigeria, generated more waste and faced greater challenges in managing it effectively, leading to poorer SWM practices.

Level of Knowledge, Attitude and Practice of Solid Waste Management between Rural and Urban Dwellers in Rivers State.

Urban residents consistently outperform rural residents in KAP levels, though both groups require improvements, particularly in attitudes towards open burning and waste segregation, emphasising the need for comprehensive, region-specific interventions in the areas of educational and infrastructural development. This finding is in agreement with that of Oluwafemi *et al,* (2020) which reported that urban residents in Lagos, Nigeria, exhibited higher levels of knowledge and better attitudes towards SWM compared to rural residents, largely due to better access to education, waste management infrastructure, and public awareness campaigns.

Conclusion

This study has provided a comprehensive assessment of the knowledge, attitude, and practice (KAP) of solid waste management (SWM) among rural and urban dwellers in Rivers State, Nigeria, addressing five key objectives. The findings reveal significant urban-rural disparities in SWM practices, with urban residents consistently outperforming their rural counterparts in KAP levels. However, both groups exhibit critical gaps, particularly in attitudes towards open burning and waste segregation, underscoring the need for targeted, region-specific interventions. The study highlights the influence of socio-demographic factors, such as household size, duration of residency, and housing type, on SWM practices, particularly in rural areas. These findings align with and contrast existing literature, reflecting the complex interplay of socio-economic, infrastructural, and cultural factors in shaping waste management behaviours.

References

Akinola, S. R., Oluwafemi, O. S., & Adeyemi, A. S. (2020). Comparative analysis of solid waste management practices in urban and rural areas of Lagos State, Nigeria. Journal of Waste Management & Research, 38(4), 456-463.

Anubi, O.O., and Elemile, O.O. (2019). Municipal solid waste management in Nigeria: A critical review. *Journal of Environmental Management*, 247, 949-974.

Eja, E.I., & Arikpo, S. A. (2011). Attitude towards waste management and disposal methods and the health status of Cross Rivers Stsate, Nigeria. *Scirea journal of agriculture*, volume 1, issue 2

Elenwo, E. I. (2015). Solid waste management practices in Port Harcourt Metropolis; Problems and prospects. *Journal of Geographic Thought and Environmental Studies*, 13(1), 60 - 81

Ferronato, N., and Torretta, V. (2019). Waste mismanagement in developing countries: a review of global issues. *International Journal of Environmental Research and Public Health,* 16(6), 1060.

Miezah, K., Obiri-Danso, K., Kádár, Z., Fei-Baffoe, B., & Mensah, M. Y. (2015). Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana. *Waste Management*, 46, 15-27.

Oluwafemi, O. S., & Adesina, O. A. (2021). Solid waste management practices in rural communities of Ekiti State, Nigeria: A comparative analysis. Journal of Environmental Health, 83(6), 45-52.

Oluwafemi, O. S., Akinola, A. A., & Adeyemi, A. S. (2020). Household waste generation and management practices in Lagos, Nigeria: Implications for sustainable waste management. Waste Management, 105, 1-10.

Oyedotun T.D.T, Oyedotun T.D.T, Aderonke, K. and Adeyinka, S.A. (2017). Assessment of Solid Waste Management Practices and the Role of Public Participation in Enugu State, Nigeria. *Journal of Environmental and Public Health.*

UNEP, International Resource Panel (2022) Global Material Flows Database. Available at: https://www.resourcepanel.org/global-material-flows-database