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Residents' perception of solid waste disposal practices in Sokoto, Northwest Nigeria

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Proper waste disposal is a key to protecting public health. Thus poorly managed and disposed waste encourages breeding of insect vectors and exposed public to increase risk of infection. This study aimed at determining the residents' perception about waste disposal in Sokoto metropolis. This was a descriptive cross-sectional survey conducted in Sokoto metropolis. A two stage sampling technique was used to select the survey participants. A set of interviewer-administered questionnaires were used to collect field data. Ethical clearance was obtained from state research ethics committee and in addition, individual informed consent was obtained before questionnaires were administered. Average age of the respondents was 30 years with 50% aged between 25 and 44 years. Large proportion (47.4%) of the respondents had only Quranic education. Majority (94.1%) of the respondents expressed worries about the indiscriminate littering of the metropolis with waste and more than half (55%) reported that residents were responsible for the state of poor sanitation while 38% felt it was fault of government. Although, 91% of respondents said it is appropriate for residents to clean own surroundings, 41% felt residents alone should take sole responsibility for the cleaning; while 40% felt government and residents should take joint responsibility. Less than half (46%) of respondents reported that improper waste disposal have health related problems. Although, majority respondents were disturbed with the way refuse litters the state metropolis, many are unaware of its health related problems. There is need to create awareness among general public of consequences of poor refuse disposal.

Key words: Perception, solid waste, disposal, Sokoto.

INTRODUCTION

Solid wastes are waste generated through domestic, commercial, industrial, agricultural and other social activities including institutional wastes, street sweepings and construction debris.

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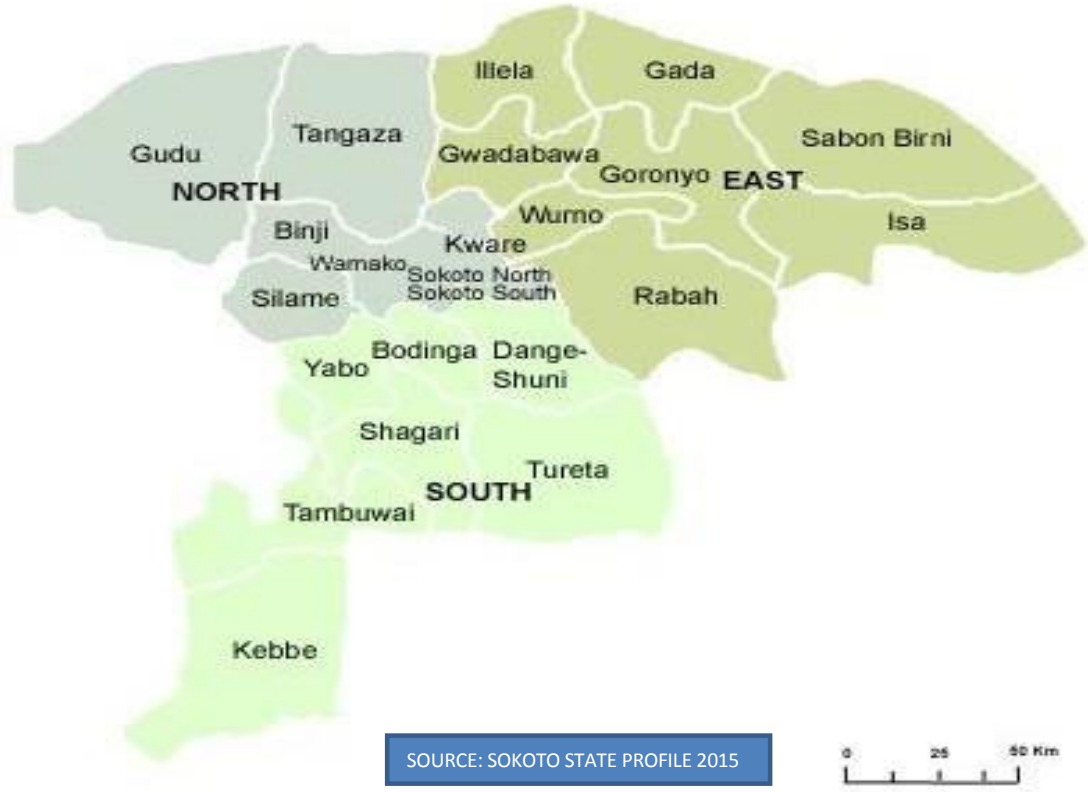

Figure 1. Map of Sokoto State in Nigeria.

Solid waste generated in many cities in Nigeria is composed of organic materials, plastics/polythene, cans/metals, bottles/glasses, clothes/shoes, and ceramics (Imoh and Udofia, 2005; Aliyu, 2010). Household waste have been found to also contain hazardous and toxic waste such as expired drugs, dried cells, broken class, syringes which constitute serious environmental and health hazards (Delgado et al., 2007).

Urban waste generation in Nigeria was reported to be in the range of 12,000 to 255,556 tons per month with Lagos, the commercial hub in the country, generating the highest followed by Kano (Ogwueleka, 2009). It is worthy to note that Lagos and Kano are the most populous state in Nigeria by 2006 National population Census. Population growth, increasing urbanization, changes in consumption pattern, and rapid developments in technology have all contributed to an increase in demand for goods and services which lead to introduction of different products to meet up with consumer need and demand (Odum and Odum, 2006). These factors together with lack of effective recycling activities resulted in an increase in both the quantity and the variety of solid wastes generated and disposed-off as waste.

The management of solid waste as important as it may disposal will affect the population's perception and willingness to participate in best waste management practices (Adekunle et al., 2012).

In Sokoto metropolis there is persistent littering of surrounding with household waste and other construction debris in manner best described as "throw it where you like" that now resulted to piles of refuse dotting the entire metropolis. This problems need to be addressed and on this background the study was conducted to determine the public opinion and perception on solid waste disposal method in the metropolis and to see whether the littering is related to the perception of the people of Sokoto metropolis.

MATERIALS AND METHODS

Sokoto is a capital of Sokoto State and located in the northwest region of the country Nigeria, within the latitude 12^0N and 13S, 58N and longitude 48W and 60-54E bounded in the north by Niger Republic, Zamfara State to the east and Kebbi State to the south be is a sole responsibility of Local Government Areas and west. It has land area of 26,648.48 km^2 (Figure 1) and (LGAs) in the country. Unfortunately this level of government is not technically and financially positioned to implement this function. Where some minimal efforts are made, it is characterized by the use of inappropriate technology, inadequate collection and

transportation systems as well as unsafe final disposal options. Thus, inability of local governments to manage municipal solid wastes result to heaps of refuse dotting in major roads and highways with associated environmental contamination and pollution (Longe and Kehinde, 2005). Household wastes in Nigeria, which are of different sources, are not segregated before disposal (Longe and Williams, 2006). This is better attributed to lack of integrated waste management system which promotes waste reduction, reuse and recycling activities. A similar condition is prevalent in Indian as reported by Chattopadhyaya et al. (2011) where household were not segregated coupled with poor waste collection system.

The perception of one's capability is said to set a limit to what to do and ultimately what can be achieved (Holland and Rosenberg, 1996). Perception influences how a person views himself and the world around him and how it tends to govern his behaviour. Dann Marie (2009) reported that residents' perception are positively correlated with solid waste management practices. This suggests that residents with positive environmental perception tend to perform responsible solid waste management which entailed waste collection and proper disposal.

Population perception of waste management describes the whole process of how the populace comes to know what is going on regarding best practices in waste management. Awareness and enlightenment programs through information, education (formal and informal), capacity building, coupled with implementation and execution of laws and regulations on proper waste population size of 3,696,999 (2006 national population census) with the metropolis being the most populous. The people of Sokoto are mainly Hausa and Fulani; others are Yoruba, Ibo, Zabarmawa, Nupe and some other tribes from other part of the country. The people of the state are mainly Muslim but Christianity is also practiced by some other tribes in the state. The vegetation is that of savannah zone with grass land suitable for cultivation of grains and animal husbandry. Many are engaged in farming and trading while also a significant proportion engaged in white collar job. Sokoto state has a mean annual rainfall of about 500 mm - 1,300 mm and temperature of 28.3°C.

A cross-sectional descriptive household survey design was used to explore public perception of refuse disposal in the Metropolis. The metropolis is made up of four local government areas (LGA) which included Sokoto North, Sokoto South, Part of Wamakko and Dange-Shuni. Each of these LGA consisted of ten political wards with each ward having number of settlements unevenly distributed. A total of nine hundred and two respondents participated in the survey. A multistage sampling technique was used to select the participants.

First, a simple random sampling method (balloting technique) was used to select five wards from each LGA. A list of all wards by local government areas in the metropolis was obtained and used as sampling frame. Secondly, from the each selected wards, five settlements were selected using simple random sampling method (Balloting technique). Third, a random sample of required size was allocated to each selected settlement using a stratified sampling method (proportional allocation technique) based on population distribution which resulted in unequal number of respondents being selected. Forth, using systematic sampling method, a number of compounds were selected based on proportion allocated to each selected settlement. From selected houses, a questionnaire was administered to the head of household, and where more than one household, a simple random sampling method (Balloting technique) was used to select one household head.

Data was collected by face to face interview using questionnaire that contained both open-ended and close-ended questions. Research assistants were drawn from the political wards selected for study and adequately trained to ensure adequacy and accuracy of the information to be collected during the interviews. After the training, research assistants were posted to their wards to administer the questionnaires.

Data collected was entered into and analyzed using Statistical Package for the Social Science (SPSS) version 17.0. The skewed quantitative data was summarized using Median and inter-quartile range while categorical variables using frequencies and percentages. The results were presented in tables and charts. Ethical approval to conduct the study was obtained from Sokoto State Health Research Ethics Committee and permission for community entry was granted by the District head of each of the selected ward. In addition, individual consent was obtained from the participants before the questionnaires were administered.

RESULTS

Table 1 showed that the respondents' median age was 30 years, IQR: 25- 43. There were more male (53%) respondents than females (47%). More than half (53%) had no formal education and among those that had formal education, only 18.3% completed secondary education while about 20% had tertiary education. Thirty five percent of the survey respondents were unemployed, 14% were traders and lecturers/mid-level business men, Top business men/civil servant made up 13% each. The majority ethnic group was Hausa (68.1%) while other minor ethnic groups accounted for 12.4% of the total. About one-third (30%) of the respondents had an estimated annual household income of less than N50,000 while 18% earned between N50,000 and N100,000 annually. A large proportion (57%) lived in houses with shared facilities while 43% lived in self-contained houses (flat, Bungalow or Story building).

Figure 2 showed that on the respondents' perception of sanitation situation in the state, of the eight hundred and forty three respondents, 94.1% feel worried how solid waste litters the metropolis. Among this proportion, 14.8% perceived it as a minor problem while 14% perceived it as a major problem.

Table 2 showed that 55% of the respondents reported that residents are responsible for the poor sanitation while 38% said government and 7% don't know who is responsible. For the cleaning of the surrounding, 41% of respondents said resident is responsible for cleaning their environment, 19% government and 40% said its responsibility of both government and the residents. Large number of respondents (63%) use children to dispose household refuse. majority of these children are from the household (59%) while 27% were Almajiris.

Table 3 showed that more than half (55%) of the respondents disposed their waste on an open field while30% burn their waste. Commonly used storage containers for house hold waste was old bucket (31%),

Table 1. Demographic and socio-economic characteristics of respondents.

Variables	Number (%)
Age groups (years)	
18-24	208 (23.1)
25-34	311 (34.5)
35-44	166 (18.4)
45-64	184 (20.4)
≥ 65	33 (3.7)
Sex	
Male	481 (53.4)
Female	419 (46.6)
Education level	
No formal education	474 (52.7)
Primary education	84 (9.4)
Secondary education	164 (18.3)
Tertiary education	174 (19.5)
Ethnic group	
Fulani	105 (11.3)
Hausa	633 (68.1)
Ibo	29 (3.1)
Yoruba	48 (5.2)
Others	115 (12.4)
Marital status	
Single	266 (29.2)
Married	582 (63.9)
Divorced	13 (1.4)
Widowed	50 (5.5)
Occupation	
Unemployed	314 (34.8)
Student	55 (6.1)
unskilled labourers	36 (4.0)
Trading/business	242 (26.8)
Skilled artisan	37 (4.1)
Civil servant	219 (24.3)
Respondents estimated annual household income	
<50,000	147 (30.0)
<100.000	89 (18.2)
<200,000	77 (15.7)
<500,000	65 (13.3)
<1,000,000	47 (9.6)
>1,000,000	65 (13.3)

Table 1. Contd.

Respondents type of houses	
Mud hut	88 (9.9)
Multiple hut unit	67 (7.6)
Mud house ± cement facing	121 (13.7)
Single room in a house shared by other household	142 (16.0)
Flat with shared facilities	172 (19.4)
Flat (self-contained)	193 (21.8)
Bungalow (self-contained)	85 (9.6)
Storey building (self-contained)	17 (1.9)

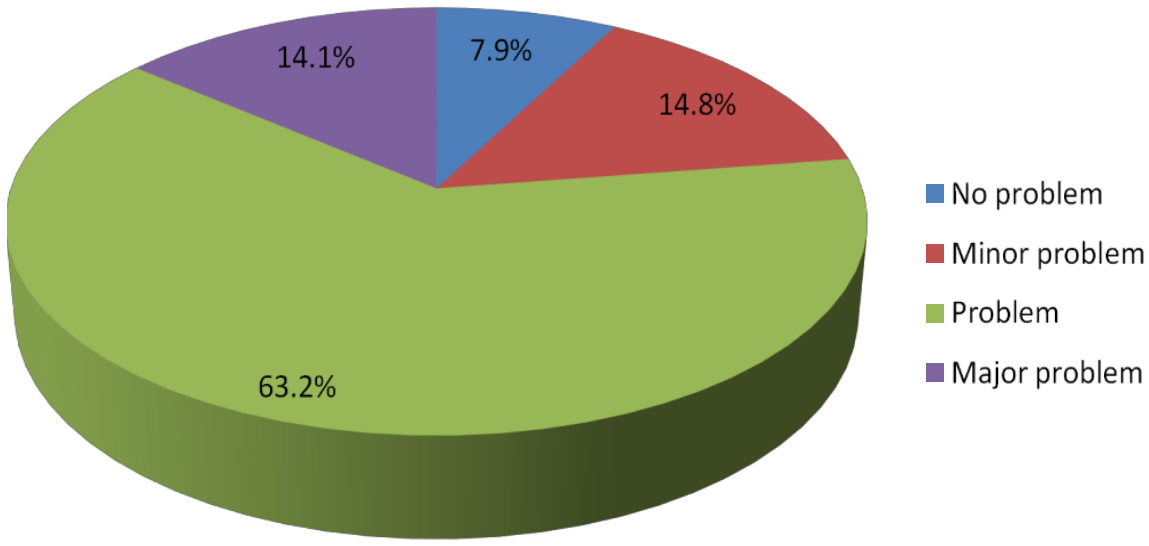

Figure 2. Respondents' perceptions of solid waste problems.

Table 2. Resident opinions on waste problem and handling responsibilities.

Variables	Number (%)
Feel worried how refuse litter the metropolis	
Yes	843 (94.1)
No	53 (5.9)
Who responsible for the problem of sanitation	
Residents	491 (55.4)
LGA	209 (23.6)
State	126 (14.2)
Don't know	61 (6.9)
Whose responsibility to clean surrounding	
Residents	315 (41.1)
Government	142 (18.5)
Both	310 (40.4)

Table 2. Contd.

Appropriate for resident to clean own surrounding	
Yes	845 (90.9)
No	51 (5.7)
Use children to dispose household refuse	
Yes	507 (62.6)
No	303 (37.4)
What category of children	
From household	383 (58.5)
From neighborhood	97 (14.8
Almajiris	175 (26.7)

Table 3. Household solid waste storage and disposal practice.

Variables	Number (%)
Storage containers for household waste	
Sacks	209 (25.3)
Plastic containers	175 (21.2)
Old bucket	257 (31.2)
Polythene bags	23 (2.8)
Waste bins	96 (11.6)
Waste bin with liners	36 (4.4)
Dump	29 (3.5)
Method of household waste disposal	
Burning	264 (30.2)
Burying	19 (2.2)
Open space dumping	483 (55.2)
Manuring	48 (5.5)
Government collected	61 (7.0)

while 3.5% of the respondents dump the waste on open field.

The chi-square analysis (Table 4) showed that only respondents' educational level (Fischer exact = 11.15, P= 0.02); awareness of associated health problems (Fischer exact = 5.10, P = 0.03); and feeling worried about dirty environment (X^2 = 194.78, df = 1, P = 0.001) demonstrated statistically significant association with their perception on waste disposal method.

Binary logistic regression analysis using forced entry method (table not shown) showed that only respondents' educational level demonstrated statistically significant association with their perception and thus did predict respondents' perception to waste disposal method in the metropolis (aOR =4.5, P = 0.001) and those with tertiary education (aOR = 2.5, p = 0.01). This means that respondents with tertiary education are about 2.5 times more likely express positive perception to the method of solid waste disposal in the metropolis.

DISCUSSION

Many approaches such as economic, engineering, scientific, environmental and behavioural have been used in the study of waste management. However, this study explores behavioural perspective with the view that the way people particularly manage waste is closely related to their attitude and perception. Individual perception is governed by past experience and present outlook, conditioned by values, moods, socials circumstances and individual expectation.

Within the household setting there exist distinctive division of labour between males and females. The

Table 4. Relationship between socio-demographic and related factors to respondents' perception of waste disposal practices.

Variables	Perception to waste disposal		
Age groups (years)	**Poor perception, n (%)**	**Good perception, n (%)**	**Test statistics and p value**
18-24	145 (21.6)	59 (27.3)	$X^2 = 3.19$, df =4, p =0.53
25-34	237 (35.3)	68 (31.5)	
35-44	124 (18.5)	39 (18.1)	
45-64	140 (20.9)	42 (19.4)	
≥ 65	25 (3.7)	8 (3.7)	
Sex			
Male	357 (52.9)	116 (54.0)	$X^2 = 0.07$, df =1, p =0.79
Female	318 (47.1)	99 (46.0)	
Educational level			
No formal education	358 (53.3)	113 (52.5)	Fischer exact = 11.15 P = 0.02*
Primary education	60 (8.9)	21 (9.8)	
Secondary education	133 (19.8)	31 (14.4)	
Tertiary education	120 (17.9)	50 (23.2)	
Ethnic group			
Fulani	83 (12.5)	20 (9.4)	Fischer exact = 2.99 P = 0.99
Hausa	470 (70.8)	154 (72.3)	
Ibo	22 (3.3)	7 (3.3)	
Yoruba	35 (5.3)	13 (6.1)	
Others	54 (8.2)	19 (8.8)	
Marital status			
Single	196 (28.8)	69 (31.4)	Fischer exact = 2.30 P = 0.51
Married	436 (64.0)	137 (62.3)	
Divorced	12 (1.8)	1 (0.5)	
Widowed	37 (5.4)	13 (5.9)	
Occupation			
Unemployed	239 (35.4)	73 (33.5)	Fischer exact = 5.61 P = 0.88
Student	44 (6.5)	11 (5.0)	
Unskilled labourers	20 (3.0)	14 (6.4)	
Trading/business	186 (37.5)	56 (25.7)	
Skilled artisan	30 (4.4)	7 (3.2)	
Civil servant	129 (19.1)	44 (20.2)	
Willingness to pay			
Yes	218 (41.4)	58 (34.9)	$X^2 = 2.23$, df = 1, p = 0.14
No	308 (58.6)	108 (65.1)	
Awareness of associated health problems			
Yes	290 (45.5)	87 (46.8)	Fischer exact = 5.10 P = 0.03*
No	347 (54.5)	99 (53.2)	
Worried about dirty environment			
Yes	695 (100)	148 (73.6)	
No	0	53 (26.4)	

*Significant at α error of 0.05.

current practice of household waste handling is considered and designated as women's responsibility however construction and demolition debris are considered man's responsibility. As part of proactive measures to protect public and the environment from the impact of the waste, the Nigerian Federal and state governments established various governmental authorities and agencies in addition to various statutory regulations guiding solid waste management in Nigeria that would ensure efficient and effective mode of waste management. These includes: National Environmental Standards and Regulations Enforcement Agency, Federal Ministry of Environment, State Ministries of Environment and State Environmental Protection Agencies (ELRI, 2009). The state also recently established task force for sanitation and illegal structures in order to promote clean and aesthetic environment.

Despite all these commitments, waste management in the country is still at primordial stage probably due to serious legal and policy gaps. Waste management system in developed nations with modern technologies, are maintained efficiently with minimal environmental impacts. However, in developing and yet to develop nations, poor waste management practices particularly in urban centres have been attributed to various environmental problems (Salhofer et al., 2008), (Ngoc and Schnitzer, 2009), (Rahji and Oloruntoba, 2009).

Observation during community walk-through revealed that there was no house to house waste collection and almost all the household waste is deposited at the dumps with no prior sorting and segregation. This indicated lack of formal waste management system in place with state employed cleaning companies also practicing the same. This observation is in tandem with report from Ijebu-ode, Nigeria where waste was observed to be left in piles for weeks around the dwellings most especially closer to the kitchen. These the study noted to create unaesthetically environmental condition (Banjo et al, 2009). Although a significant proportion of the resident expressed positive perception to the manner with which waste litter the whole metropolis however only very few perceived it as a serious problem. This study also revealed children involvement in the waste handling and disposal with large proportion admitting using children to dispose household waste onto the dumps and these children are largely from the household while Almajiris (children attending local islamiyya schools) also constituted another bulk of children involved in the household waste stream management. Poor implementation of international labour laws and child labour act promote the continuous use of underage children in waste collection and disposal services. Household wastes were found stored in different ways using inappropriate receptacles. There is no common or standard secured storage containers such as steel containers with secured lid as seen in some state and developed countries. The current storage facilities are prone to being scattered by scavenging animals and thus attract insects and vermins and some of the wastes are even spread around before getting to the dump site. This could be due to general poor perception of the problem and cost associated in obtaining standard containers. Study in southern Nigeria reported involvement of private waste managers by about 50% of the respondents, majority others used several unsanitary methods to get rid of the waste like dumping into gutter, burning, dumping on undeveloped land, while few others buried theirs (Banjo et al., 2009, George, 2008).

In order to improve solid waste management best practices, there is strong need for the government concerned to promote local community capacity through sensitization and awareness creation through campaigns, establish community waste management structure, support private partnership in waste collection and also organize well supervised community cleanup exercises.

Conclusion

Unsanitary solid waste disposal practice is still very popular in spite of documented associated health hazard. Even though large majority of residents expressed worries the manner waste dot the metropolis, only small minority perceived it as a major problem. There is need for government to introduce better waste containers replace what the majority of residents currently use.

Conflict of Interests

The authors hereby declared that there was no conflict of interest as it relates to the conduct; outcome of this research work and its publication.

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