Original Research Article

Assessment of Waste Management Practices among Traders in Major Markets in Owerri, Imo State, Nigeria

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ABSTRACT

Background: Poor market sanitation due to poor waste management practices is a serious public health problem, as unmanaged wastes from markets which are both bio and non-bio degradable, pose potential health risks for the transmission of diseases.
Aim: To assess the waste management knowledge, attitude, and practice among traders within market environments in Owerri, Imo State, Nigeria.
Methods: This was a descriptive cross sectional study design carried out among 400 market traders who own shops in the selected markets and they were enrolled using a proportionate systematic random sampling technique. Information about waste management was collected using a pretested, semi structured, and interviewer administered questionnaire.
Results: About 87.6% of the respondents were aware of waste management and the common source of information was from the radio, (74.9%) and market associations, (65.6%). The estimated average quantity of waste generated among traders per shop per day was 7.5 ± 2.5kg. The common type of wastes generated were biodegradable, (94.2%) and recyclable, (82.5%) wastes. The commonest method of waste disposal was open dumping, (96.7%) with majority of the traders not practising waste segregation, (98.2%) before disposal of waste. There was a statistically significant relationships between knowledge ($p<0.0001$), level of attitude ($p<0.0001$) and level of education ($p<0.0001$) of traders and practice of waste management.
Conclusion: In order to attain a proper and good level of waste management practice among market traders, it is critically important to institutionalize consistent, appropriate and periodic health education on waste management within the markets.

Keywords: waste management, practices, markets, Owerri, Nigeria.

INTRODUCTION

As population densities per capita waste generation increases, the available land for waste disposal decreases proportionately and as a result sanitation has emerged as an essential specialized sector for keeping cities or gatherings of people, healthy and live able; and therefore, one of the key challenges of the 21st century. Also, a key responsibility of the local governments is managing solid waste well and affordably. [1-3]

Generally, the composition of waste produced is influenced by culture, economic development, geographic location, climate and energy resources and its composition influences how waste is collected and disposed. Low income countries have the highest proportion of organic waste with a high percentage of organic matter in urban

waste stream ranging from 40-85%. In terms of the disposal of waste, although quantitative data is not readily available, it has been reported that most low and lower middle income countries have low levels of collection services with the disposal of their waste mainly in open dumps associated with open burning. [4,5]

Similarly, the Nigeria situation is no different and according to World Health Organisation/ The United Nations Children's Emergency Fund (WHO/ UNICEF) and United Nations Development Programme(UNDP) reported that access to adequate sanitation which was particularly marked in urban areas, decreased from 35% in 2010 to 33.7% in 2012 which was far below the 69.5% MDG target for 2015. [6,7] So, the prevailing poor sanitation in the Nigerian markets is a reflection of the deplorable sanitation situation in the country.

The market place, a major source of solid waste, is an important structural part of the local economy occupying an important social and economic position in the lives of Nigerians and as such it is a high vulnerable place with the convergence of people, attracting large gatherings of buyers, sellers and their children who either accompany their parents or are alone to sell or buy products. [8,9] These people especially the adult sellers and their children spend a greater part of the day within the market environment and therefore, can be called market residents and as such, the improper, unsafe and un healthy manner in which they collect and dispose of waste among themselves, provides opportunities for the increased risk and spread of diseases. These waste management practices which are associated to their attitudes, perceptions, motivations and incentives, [10] are all contributory to their existing sanitation problems.

All activities in solid waste management involve risk either to the workers involved in collection or to the market residents, as these risks occur at every step of the process from the point of handling the waste to the point of final disposal with children being particularly vulnerable to the risks associated with these waste because of their behaviour and physiological characteristics. [5]

Solid waste that is not properly collected and disposed can block drains, cause flooding and accumulate on open areas and therefore become breeding grounds for insects, vermin, scavenging animals and people which in turn become sources for air and water borne diseases. A number of studies have shown that among residents and especially sanitation workers, there is a 6 times more relative risk of infectious diseases, 10 times more relative risk of acute diarrhoea and 3 times more relative risk of allergic pneumonia and parasitic diseases. [11-13] Soit is obvious, that an unclean environment will affect the health, productivity and quality of life of the people.

For an effective waste management system to be developed, the knowledge, attitudes and practices of the producers of waste in addition to the waste composition and volume must be known and also the existing safe, effective and sustainable local options in the management of waste must be understood. [14] Therefore, it is imperative that a comprehensive waste management plan with a winning strategy that bridges the identified gaps in the knowledge, attitude and practices and also identifies and improves already working indigenous processes is critically important. Thus the aim of this study is to assess the waste management practices in the selected study sites and the factors influencing their practices.

METHODOLOGY
Study Area
The study was conducted among market traders with shops within two principal markets; Eke Ukwu and Relief markets in Owerri municipal of Imo State, South East, Nigeria. Owerri municipal is one of the three local government areas that make up the Owerri, the capital of Imo

State. It is predominantly an urban area covering 58sq km with an estimated population of 127,213 according to the 2006 census. [15] The Eke Ukwu and Relief markets are composite markets comprising of 2112 and 3066 shops respectively. They are among the largest markets in the State with large patronage of buyers and sellers.

Study Population/ study design

The study population comprised of market traders with shops from Eke Ukwu and Relief markets in Owerri Municipal Local Government Area (LGA) of Imo State. The study design was a descriptive cross sectional study.

Sample Size Estimation

The minimum sample size was calculated using the Cochran formula, (Z^2pq/d^2) [16] for determining adequate sample size and further correcting for populations less than 10,000, using **n_1=N/1+(N/n)**

When n= minimum sample size, Z= Standard normal deviate corresponding to the probability of type I error, p = prevalence in previous studies [8], q=1-p, d= precision set at 0.05, n_1= corrected sample size. Thus a sample size of 400 respondents was studied taking into consideration a 20% attrition rate.

Sampling Technique

The sampling technique used for this study was the systematic random sampling technique. For each market the total population of shops was established after which, different sampling fractions were calculated based on the existing population of shops within each market. In the Eke Ukwu and Relief markets, a sampling fraction of 10 and 15 respectively were used to select 200 market traders each with shops. For the Eke Ukwu and Relief markets, the index shop was selected using simple random sampling by balloting and then selection of shops that were studied continued in multiples of 10 and 15 respectively until 200 shops in each market were selected. If a market trader was unavailable in a selected shop, then the immediate preceding shop was selected.

Data Collection and Analysis

Information from the respondents was collected using a pretested, semi structured, interviewer administered questionnaire which was developed and validated for consistency. The questionnaire comprised 4 sections; section one: the socio-demographic characteristics, section two: the knowledge and awareness of waste management, section three: the attitudes towards waste management and section four, waste management practices. In assessing the level of knowledge, attitude and practices of the market traders, a score of 1 was given for any correct or positive answer within the respective sections assessing the knowledge, attitude and practice and zero for an incorrect or negative answer. The score for each respondent was then aggregated and assessed against the scale of 0 for no knowledge, attitude or practice, 1-4 for poor knowledge, attitude or practice, 5-6 for fair knowledge, attitude or practice and 7-9 for good knowledge, attitude or practice. Data entry and analysis was carried out using a computer software, SPSS-IBM (Chicago USA) version20 and descriptive analyses were presented in frequency tables and summary indices. Chi square statistic was used to test significant relationships between categorical variables and p-value of ≤0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Imo State University Teaching Hospital (IMSUTHEC). All authors hereby declare that the study was therefore conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

RESULTS

Four hundred questionnaires were distributed with one questionnaire per shop. Three hundred and ninety five questionnaires were completely and correctly filled with a response rate of 98.8%.

Socio - demographic Characteristics (Table 1)

Table1: Sociodemographic Characteristics of Respondents (n=395)

Variable	Category	Frequency (%)
Age(Years)	15-19	18(4.6)
	20-29	100(25.3)
	30-39	127(32.2)
	>40	150(38.0)
Mean age	35.5±8.8	
Gender	Female	211(53.4)
	Male	184(46.6)
Religion	Catholic	158(40.0)
	Pentecostal	103(26.1)
	Anglican	90(22.8)
	Non- Christian	44(11.1)
Ethnic Group	Igbo	360(91.1)
	Non-Igbo	35(8.9)
Education	None	9(2.3)
	Primary	97(24.6)
	Secondary	228(57.7)
	Tertiary	61(15.4)

The mean age of the respondents were 35.5±8.8 years with majority of them being ≥ 30 years (70.2%). There were more females (53.4%) than males (46.6%).

Higher proportion of the respondents was Catholics (40%) with majority of them belonging to the Igbo ethnic group (91.1%). Many of them attained secondary education (57.7%).

Awareness and Sources of Waste Management Knowledge (Table 2)

Majority of all the respondents, (88%) were aware of waste management with 93% and 92% of those aware of waste management also being aware of the general importance of the practice and its importance to the health of populace respectively. Common components of waste mentioned by the respondents were; biodegradable waste, (97.7%), recyclable waste, (97.0%), and domestic hazardous waste, (76.7%). Open dumping (98.6%) and burning (94.5%), were the common methods of waste disposal known while the radio (74.9%) was the commonest source of information about waste management.

Table2: Awareness and sources information of waste Management

Variable	Category	Frequency (%)
Awareness about waste management (N=395)		
	Yes	346(87.6)
	No	49(12.4)
Awareness about the importance of waste management(n=346)		
	Yes	321(92.8)
	No	25(7.2)
Awareness on importance of waste management in improving health (n=346)		
	Yes	317(91.6)
	No	20(5.8)
*Awareness about waste disposal waste methods (n=346)		
	Open dumping	341(98.6)
	Burning	327(94.5)
	Burying	171(49.4)
	Composting	146(42.2)
	Land fill	98(28.3)
	Incineration/mechanical	79(22.8)
	Hog feeding	36(10.4)
	Others	5(1.5)
*Components of waste known (n=395)		
	Biodegradable	394(97.7)
	Recyclable	383(97.0)
	Domestic/hazardous	303(76.7)
	Building/demolition	212(53.7)
	Electronic	164(41.5)
	Others	62(15.7)
*Sources of information about waste management (n=346)		
	Radio	259(74.9)
	Market association	227(65.6)
	Television/ newspaper	213(61.6)
	Waste disposal agencies	91(26.3)
	Friends/relatives/neighbors	77(22.3)
	School/ teachers	56(15.9)
	Meeting/seminars	36(10.4)
	Internet	17(4.9)
	Others	2(0.8)

*=multiple response

Waste management practices among traders in the selected markets. (Table 3)

Table 3: Waste management practices among traders in the selected markets

Variable	Category	Frequency (%)
*Composition of wastes generated (n=395)		
	Biodegradable	372(94.2)
	Recyclable	326(82.5)
	Domestic/hazardous	60(15.2)
	Electronic	47(11.9)
	Building/demolition	31(7.8)
	Others	24(6.1)
Estimated quantity of waste generated per shop per day (n=395		
	< 1bucket(<5kg)	60(15.2)
	1-2 buckets(5-10kg)	281(71.1)
	3-4 buckets (11-20kg)	44(11.2)
	>4buckets(>20kg)	10(2.5)
Forms of waste storage before disposal (n=395)		
	Bags/sacks	106(26.8)
	Open buckets	91(23.0)
	Closed bins	69(17.5)
	Open bins	62(15.7)
	Baskets/cartons	42(10.6)
	Open dumping on the floor	14(3.6)
	Trolley	11(2.8)
Means of transport to temporary market dumpsite (n=395)		
	Dragging on the floor	181(45.8)
	Wheel barrow	96(24.3)
	To waste carrier	95(24.1)
	Head haulage	23(5.8)
Presence of centralized temporary dump site in the market (n=395)		
	Yes	383(97.0)
	No	5(1.3)
	Not sure	7(1.8)
Segregation of waste before disposal(n=395)		
	Yes	7(1.8)
	No	388(98.2)
Main disposal method practiced (=395)		
	Open dumping	382(96.7)
	Burning	13(3.3)
Frequency of waste disposal(n=395)		
	Everyday	150(38.0)
	Weekly	191(48.3)
	When the bin is full	54(13.7)
Means of transport to final dumpsite (n=395)		
	Open trucks	268(67.8)
	Closed trucks	90(22.8)
	Pick up van	37(9.4)
Frequency of waste evacuation to permanent dumpsite(n=395)		
	Daily	27(6.8)
	Weekly	54(13.7)
	Biweekly	238(60.2)
	Monthly	13(3.3)
	≥2monthly	63(15.9)
Presence of a waste policy in the market(n=395)		
	Yes	96(24.6)
	No	299(75.6)

Majority of the respondents indicated that the composition of the waste generated by them were biodegradable, (94%) and recyclable, (83%), with 77% of the respondents indicating that their biodegradable waste consist paper and 58% indicating that their recyclable waste consist of plastics/polyethenes. Majority of the respondents, (71%) indicated that they generated a maximum of 5-10 kg of waste per shop per day with an estimated average waste generation of 7.5±2.5kg per shop per day. Major forms of waste storage before disposal were in; bags/sacs, (26.8%), open buckets, (23.0%), closed bins, (17.5%) and open bins, (15.7%) with dragging, (45.8%) being the commonest form of transport to the temporary dump site. Majority of the

respondents, (97.0%) agreed that the market has a temporary centralized dumpsite. Most of the respondents, (98.2%) do not segregate their waste before disposal and majority of them, (96.7%) practice open dumping as their main form of waste disposal. Close to half of the respondents (48.3%) dispose their waste weekly and the use of open trucks, (67.8%) was the major mode of transport of waste to the final dumpsite. Many of the respondents, (60.2%) agreed that waste was evacuated from the temporary site, once in two weeks and majority of them, (75.6%) stated that there was no waste management policy domiciled in the markets.

Level of Knowledge, Attitude and Practice towards Waste Management (Table 4)

While about half of the respondents (51%) had a good level of attitude towards waste management, only about one third (33%) of the respondents had a good level of knowledge of waste management with about 45% of respondents having a poor level of waste management practice.

Table 4: Level of Knowledge, Attitude and Practice (n=395)

Variable	Category	Frequency (%)
Level of Knowledge	None	49(12.4)
	Poor	27(6.8)
	Fair	187(47.4)
	Good	132(33.4)
Level of Attitude	Poorer	36(9.1)
	Poor	39(9.9)
	Fair	119(30.1)
	Good	201(50.9)
Level of Practice	Poor	177(44.8)
	Fair	113(28.6)
	Good	105(26.6)

Table 5: Factors Associated with Waste Management Practice

	Waste Management Practice (n=395)						
	Poor	Fair	Good				
Variable	n (%)	n (%)	n (%)	Total (%)	χ^2	df	p-value
Age							
15-19	9(50.0)	6(33.3)	3(16.7)	18(100)	6.82	6	0.338
20-29	53(53.0)	27(27.0)	20(20.0)	100(100)			
30-39	56(44.1)	37(29.1)	34(26.8)	127(100)			
>40	59(39.3)	43(28.7)	48(32.0)	150(100)			
Total	177(44.8)	113(28.6)	105(26.6)	395(100)			
Gender							
Female	95(45.0)	65(30.8)	51(24.2)	211(100)	1.76	2	0.415
Male	82(44.6)	48(26.1)	54(29.3)	184(100)			
Total	177(44.8)	113(28.6)	105(26.6)	395(100)			
Education							
None	3(33.3)	4(44.5)	2(22.2)	9(100)	53.5	4	0.000*
Primary	52(53.6)	37(38.1)	8(8.3)	97(100)			
Secondary	113(49.6)	55(24.1)	60(26.3)	228(100)			
Tertiary	9(14.7)	17(27.9)	35(57.4)	61(100)			
Total	177(44.8)	113(28.6)	105(26.6)	395(100)			
Religion							
Catholic	72(45.6)	40(25.3)	46(29.1)	158(100)	3.6	6	0.730
Pentecostal	50(48.5)	29(28.2)	24(23.3)	103(100)			
Anglican	35(38.9)	30(33.3)	25(27.8)	90(100)			
Non-Christian	20(45.5)	14(31.8)	10(22.7)	44(100)			
Total	177(44.8)	113(28.6)	105(26.6)	395(100)			
Waste Generated							
<5kg	32(53.3)	15(25.0)	13(21.7)	60(100)	4.3	4	0.362
5-10kg	117(41.6)	86(30.6)	78(27.8)	281(100)			
11-15kg	23(52.3)	10(22.7)	11(25.0)	44(100)			
>15kg	5(50.0)	2(20.0)	3(30.0)	10(100)			
Total	177(44.8)	113(28.6)	105(26.6)	395(100)			
Level of Knowledge							
None(0)	3(69.4)	8(16.3)	7(14.3)	49(100)	43.8	6	0.000*
Poor(1-4)	18(66.7)	4(14.8)	5(18.5)	27(100)			
Fair (5-6)	91(48.7)	58(31.0)	38(20.3)	187(100)			
Good (7-9)	34(25.8)	43(32.6)	55(41.7)	132(100)			
Total	177(44.8)	113(28.6)	105(26.6)	395(100)			
Level of Attitude							
Very poor(0)	25(69.4)	6(16.7)	5(13.9)	36(100)	44.6	6	0.000*
Poor (1-4)	30(76.9)	5(12.8)	4(10.3)	39(100)			
Fair (5-6)	57(47.9)	40(33.6)	22(18.5)	119(100)			
Good (7-9)	65(32.3)	62(30.9)	74(36.8)	201(100)			
Total	177(44.8)	113(28.6)	105(26.6)	395(100)			

*Significant

Factors Associated with Waste Management Practice

The following factors were significantly associated with waste management practice; Level of knowledge (p<0.0001), level of attitude (p<0.0001) and the level of education (p<0.0001) while age, gender, the quantity of waste generated per shop per day and the religious denominations were not significantly associated with waste management practice. (p>0.05) Table5

DISCUSSION

This study assessed the knowledge, attitudes and waste management practice of market traders. The socio-demographic distribution of the respondents were similar to pattern found in a previous study done in Nigeria among market traders. [8] These public markets which trade mainly in food and associated items were known to be operated predominantly by women with little or no education as it was culturally seen as a role for women, but in recent times, with the deteriorating economic situation and rising unemployment, it appears that more men and more educated people are engaging in public market activities in our environment. This probably explains the observation in the present study where there is almost a 1:1 ratio in gender distribution with twice as many respondents with a secondary school education when compared to those with a primary education or less.

With the exception of the level of education, the socio - demographic characteristics of the respondents in this study; age, gender and religion were not significantly associated with the practice of waste management, this is not consistent with a previous study from the South Western part of Nigeria that reported that, age, gender and educational status were factors influencing the practice of solid waste management. [17] Similarly, a number of other studies have consistently reported that the level of education but not gender was associated with waste management

practice. [18-23] Though an earlier study [24] found that women were significantly more likely than men to be concerned with environmental issues and have a more positive attitude with a better level of environmental management practice. This view is not consistent with the observations in the present study where gender was not associated with practice. This could probably be explained by the fact that the waste management awareness campaigns over the years are raising the consciousness of waste management practice and associated health benefits among men, as more men get involved in waste generating activities that were previously seen as exclusive for women. The present study further highlights this possibility, where the majority of the respondents both male and female were aware of waste management and its importance to their health.

The major sources of information for the respondents were from the market associations and the mass media mainly from radio. This role of the mass media in waste information dissemination was reported by Adogu et al., (2015). [23] It was observed that despite the high awareness of waste management, majority of respondents had a fair to good level of knowledge about it and the disposal methods they were most conversant with were open dumping, burning and burying. So it would appear that, though a majority had at least a fair level of knowledge, the knowledge they had, was not appropriate as open dumping, burying and burning seem to be a very common practice in Nigeria which has also been reported Ian number of Nigerian studies. [8,9,17,23,25]

Majority of the traders stored their waste with bags, buckets, open or closed dust bins before disposal. This finding is similar to that reported from Zaria, Northern Nigeria, by Idris et al., 2009, [26] which found that the predominant method of waste storage was dust bins without cover, (40.3%), next was dustbin with cover (30.1%) while open dumping accounted for 19.5%. It was also similar that reported

from Accra, Ghana where majority of the households stored their waste in open containers and plastic bags in their home. [27] This finding was different from that reported in Owerri [23] and Awka [28] cities in Nigeria which stated that the use of covered bins for waste storage was high. This high proportion of poor waste storage found in this study is worrisome as this will encourage direct exposure to flies, vermin and scavengers which will in turn increase infectious disease transmission together with increase in bad odour and unsightliness which is common with uncovered waste. [19,28] Wastes were collected biweekly from the market temporary dumpsite to the final disposal place mostly by open trucks. This finding is similar with what obtains in South African where domestic waste is collected weekly from households by Municipality trucks. [29] Only a few traders, (3.3%) segregate their waste before disposal while the rest of the households, (96.7%) do not segregate their waste before disposal, this is a reflection of what happens in most African countries. [2,19,23,28,30] This situation creates a suitable environment for breeding of disease vectors, such as mosquitoes and cockroaches, and the proliferation of rodents, such as rats and mice, which pose threats to public health. A study in Zambia, [20] reported that participation in solid waste separation as a method of waste management depended on the level of awareness and educational status which is not consistent with the present study. These poor waste disposal practices may be due to a number of factors such as low awareness as suggested in a study in the Philippines [31] or lack of appropriate education on the immediate benefits or the perception that, it is a responsibility for others i.e. sanitation workers or the potential economic cost benefits of maintaining disposal receptacles; and as a consequence, they don't see the immediate necessity to properly store, separator dispose their waste. The estimated average quantity of waste generated by traders in this study was 7.5±2.5kg per shop per day and most of the waste produced was

either biodegradable or recyclable waste. This pattern waste component generated has been reported in several studies. [2,8,9,17,19,23,25-28] There appears to be a trend in African cities of an increasing level of plastic waste and this further emphasizes the need for waste separation activities in order to manage our waste more efficiently. [32]

Waste management practice is a major problem in Nigeria and generally, a number of studies have reported conflicting significant relationships between the level of knowledge, attitude and practice. [24,25,33-38] In the present study, a majority of the respondents had a fair to good level of knowledge and attitude but a poor to fair level of practice and this initial observation, appeared as if there was a disconnect between knowledge, attitude and practice but on further analysis it was established that the level of knowledge and attitude was significantly associated with the level of practice. According to Aiken et al., [39] practices refer to the ways in which people demonstrate their knowledge and attitude through their actions. This is consistent with studies on health behaviours that have established that, attitudes, knowledge, and practices have a strong relationship, with each, contributing in varying combinations of importance to predict behaviour. [40] Conversely, according to Rogers, [41] a favourable or unfavourable attitude towards an innovation, does not always lead directly or indirectly to its adoption or rejection. In order words, the relationship between attitudes and behaviour could be complex. This is further illustrated by Lorenzoni et al., [42] on barriers to climate change by applying the philosophy of his findings within the context of sanitation, its understanding would be that, knowledgeable participants who did not perceive poor sanitation as a direct risk but as a distant threat within the context of their daily lives, would not consider waste management as a priority and therefore would be reluctant to practice it.

CONCLUSION

Among the market traders, having a good level of waste management knowledge and favourable attitude may not always translate to a good level of practice due to a number of intervening constraints such as personal inconvenience, availability of time, costs associated with proper waste disposal, failure of the local governments to establish functioning waste disposal infrastructure and the immediate burdens of the failing economy.

So, in order to overcome some of these difficulties within our constrained environment, strategies must be implemented that will encourage individual personal efforts or driving force towards the practice of proper waste management within their local sphere of control. The health belief model approach may be a starting point to improve practice, where the belief of an immediate risk of contracting sanitation related diseases is inculcated through targeted, appropriate, periodic education and consistent awareness campaigns among the traders.

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