

Educational Status and Knowledge of Meaning, Composition and Hazards of Solid Waste among Residents in Onitsha Metropolis, Nigeria

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Abstract Background: Good knowledge of waste and its management is key to sustainable healthy living conditions in a sane environment. However, this knowledge has been reported to be influenced by many factors. **Objective:** To determine the association between educational status and knowledge of meaning, composition of solid waste and hazards of its improper management among residents in Onitsha metropolis, Nigeria. **Materials and methods:** A cross-sectional study of 425 households in Onitsha Metropolis, selected using multistage sampling technique was done. Data was collected by interview using a pretested semi-structured questionnaire and analysed using computer Graph Pad Prism version 5.3. Chi-square test was used to identify statistically significant associations between variables. A p value of < 0.05 was considered significant. **Results:** The mean age of the respondents is 36.84±12.21years. Three hundred and fifty five (83.5%) of the respondents could give the correct meaning of the term 'solid waste', 312 (73.4%) knew its composition while 351 (82.6%) had an appreciable knowledge of the health hazards of improper waste management. There are statistically significant associations between educational status of respondents and their knowledge of solid waste (p<0.05), correct knowledge of solid waste (p<0.05), knowledge of hazards of improper waste management (p<0.05) respectively. **Conclusions:** The study results revealed that Onitsha residents have a good knowledge of solid waste and this was found to be associated with educational status. We therefore recommend sustained attitudinal change program via regular and periodic health education on proper solid waste management patterns.

Keywords: Solid waste, educational status, knowledge, Onitsha metropolis

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1. Introduction

Solid waste has been defined as any material which is not in gaseous or liquid form and has no value to the person who is responsible for its generation. [1,2,3] In a study in Nairobi City, 83% of respondents knew the meaning of the term "Solid Waste" [4].

Household solid waste is cumbersome to handle because it is made up of a wide range of composite materials.⁵ It consists mainly of garbage, a term for the waste matter resulting from the preparation, and consumption of food which comprises waste food, vegetable peelings and other organic matter as well as plastics, paper, glass, textiles, cellophane, metal objects and hazardous waste from household products such as paint, pesticides, pharmaceuticals, fluorescent tubes, personal care products, batteries containing heavy metals

and disposed wood treated with anti-fungal and anti-termite chemicals [6].

Poor waste management could result in public health hazards such as fire outbreaks, injuries especially to children playing near such sites, smoke, explosion, road blockage causing accidents; pollution of land, air and water; infestation with rats and vermin leading to lassa fever, plague, murine typhus, leptospirosis; increase in breeding places for mosquitoes causing malaria, yellow fever, filariasis, dengue fever as well as fly transmitted infections e.g. diarrhoea, myiasis, typhoid, cholera. [7,8] For instance in Accra, Ghana, the presence of houseflies in the kitchen during cooking correlated with the incidence of childhood diarrhoea [9].

Opara, in a study on urban waste management in Port Harcourt metropolis of the Niger Delta region of Nigeria observed that people are not ignorant of the effect of indiscriminate waste dumping or general poor sanitation in Port Harcourt Nigeria.¹⁰ Findings from Kenya reported

that approximately 88.6% to 92.8% knew at least one environmental hazard attributable to improper management of solid waste [4].

Studies by Mwanthi *et al.*, on solid waste management in Nairobi City: knowledge and attitudes and Banga on household knowledge, attitudes and practices in solid waste segregation and recycling in urban Kampala reported that knowledge of waste disposal is influenced by many factors including educational level. [4,11] An assessment of waste management practices among residents of Owerri Municipal, Nigeria concurred that educational status of respondents significantly influenced their knowledge of waste management. [12] While a study in Ghana did not report significant effect of educational status on willingness to recycle, [13] the studies in Uganda and Nigeria agreed that educational status of respondents significantly influenced their attitude and practice of waste management as well [4,12].

If current trends in solid waste generation continue, the world may see a five-fold increase in waste generation by the year 2025. [14] In Nigeria, municipal solid waste management remains a public health concern. There is need to x-ray these aspects of knowledge of solid waste and association if any with educational status, to see how public health strategies could be instituted in this light to ensure improved waste management practices. With this backdrop, our study set out to determine the association between educational status and knowledge of meaning, composition of solid waste and hazards of its improper management among residents in Onitsha metropolis, Nigeria.

2. Materials and Methods

This descriptive cross-sectional study was carried out in Onitsha metropolis in Anambra State, Southeast Nigeria. The metropolis is sub-divided by the State Environmental Protection Agency (ANSEPA), into six zones: Okpoko, Fegge, Housing Estate, Upper Iwaka, Inland Town and Government Reservation Area (GRA). [15] The urban slum, Okpoko is characterised by low cost buildings, poor road network with high population density and the residents are mostly of low socio economic class. Fegge zone is an urban settlement in Onitsha inhabited by middle income earners. It has good road network and the accommodation is predominantly the apartment type with 4-8 households living in the same compound. The GRA is a low population density zone where usually one household or two live in a compound. The road network is good, while residents are mostly of high socio-economic class and civil servants. The drainage system is well organised in Fegge and GRA but poor in Okpoko. The inhabitants of Onitsha metropolis are predominantly traders but there is a strong presence of employees of private liability companies as well as Federal and State civil servants.

All the residents who were up to ten years old, have lived in Onitsha metropolis for at least two consecutive years in the selected households and are willing to participate in the study were enrolled.

Using the formula for sample size determination for descriptive studies in population greater than 10,000,

$$n = \frac{z^2 pq}{d^2},$$

where

n= the desired sample size (when population is >10000)
z = Standard normal deviate at 95 percent confidence interval which is set at 1.96.

p= Nkwocha *et al.*, on evaluating the efficiency of solid waste collection services in Owerri Municipality Nigeria reported about 61% efficiency in waste collection in the Municipality. [17] So p= 0.61, while q = 1 – p = 0.39
d = Degree of accuracy desired = 0.05

$$n = \frac{(1.96)^2 (0.61)(0.39)}{(0.05)^2} = 366$$

This study anticipated 80 % response rate and to make up for this, the calculated sample size n, was divided by a factor f= 80/100

i.e. nf= n/f [16] = 366/0.8= 458

Four hundred and fifty- eight questionnaires were distributed but 425 were valid on return and were thus analysed.

A multistage sampling technique was used.

Firstly, stratified sampling technique was done, grouping Onitsha into six zones, using the classification of Onitsha by ANSEPA. [15]

Secondly, stratified sampling technique was done, classifying the zones into three using social classification by occupation. [18,19]

- A. Urban Slum- e.g. Upper Iwaka and Okpoko typified by semi-skilled workers like truck drivers, machine operators, vendors, construction labourers, security agents.
- B. High density residential and commercial area e.g. Fegge and Inland Town typified by white collar and semi-professional workers, nurses, sales man, traders with shops, fashion designers and caterers.
- C. Low density residential area- e.g. GRA and Housing Estate typified by professionals in high business concern, bankers, doctors, dentists, professors, engineers and lawyers.

Thirdly, simple random sampling by balloting was done and three zones were selected, one from each area thus: Okpoko from the Urban slum, Fegge from High density residential and commercial area and the GRA from low density residential and commercial area.

Fourthly, each select area was considered a cluster. A central place in each area was located e.g. market or hall and an empty bottle was spun on the ground (the bottle made a minimum of three complete turns before stopping). When it ceased to move, the direction of the neck of the bottle was taken as the starting point for the inclusive streets.

Then systematic sampling technique was used through longitudinal recruitment of households to select eligible and consenting mothers at the household level. This enrolment exercise was continued in a clockwise direction until the required number allotted to each cluster has been obtained. Where there are more than one household within the compound, a simple random sampling method by balloting was used to select one household.

A pretested semi-structured interviewer administered questionnaire which was designed based on the research

topic and objectives: Section A consisted of bio-data of the respondents while section B consisted of questions to assess respondents' knowledge of meaning, composition of solid waste and hazards of its improper management. The questionnaire was designed in English, translated into Igbo language and then back-translated into English but was administered in Igbo language by three assistants trained in interview technique. The questionnaire was pre-tested on some residents of Nnewi, an urban area in Anambra state to determine suitability/appropriateness of the questions.

Each completed questionnaire was reviewed for completeness prior to analysis. The data collected was sorted and analyzed in respect to the demographic characteristics of the respondents. Educational level was also used in the categorisation of respondents so as to see the effect of educational level on knowledge of meaning, composition of solid waste and hazards of its improper management among residents in the Metropolis. Descriptive and analytical statistics of the data were carried out using computer Graph Pad Prism version 5.3. Summary indices were generated and descriptive data were presented as simple frequencies and percentages. Tests of statistical significance were carried out using chi square tests for proportions. A p value of < 0.05 was considered significant.

Ethical clearance was sought and obtained from Nnamdi Azikiwe University Teaching Hospital Ethical Committee (NAUTHEC) before the work was carried out. Written permission to carry out this study was sought and obtained from the appropriate authorities in the Ministry of Environment. Consent and co-operation of the respondents was solicited and obtained for the conduct and publication of this research study. All authors hereby declare that the study has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

3. Results

Table 1 shows respondents' Socio-demographic characteristics. Four hundred and fifty-eight questionnaires were distributed but 425 were valid on return and were thus analysed giving a response rate of 92.8%. The mean age of the respondents is 36.84±12.21 years. Majority of the respondents 258 (60.7%) were males and 209 (49.2%) were married. About 260 (61.2%) attained at least the secondary level of education, while more than 50% were traders.

Table 2 shows the knowledge on solid waste. Three hundred and fifty five (83.5%) of the respondents know the meaning of the term solid waste, 312 (73.4%) knew its composition, while 351 (82.6%) knew the hazards of improper waste management.

Table 3 shows the relationship between educational status and knowledge of solid waste. There is a statistically significant association between educational status of respondents and their knowledge of solid waste ($\chi^2=4.149$, $p<0.05$). Educational status is dependent on correct knowledge of solid waste ($\chi^2=5.559$, $p<0.05$), while there is a statistically significant association between their educational status and their knowledge of hazards of improper waste management ($\chi^2=3.719$, $p<0.05$).

Table 1. Respondents' Socio-demographic characteristics

Characteristics	Frequency, N=425	%
Age (years)		
10-19	21	4.9
20-29	115	27.1
30-39	125	29.4
40-49	94	22.1
50-59	47	11.1
60-69	19	4.5
70-79	4	0.9
Mean age in yrs = 36.84 ±12.21 years		
Sex		
Male	258	60.7
Female	167	39.3
Male: Female = 1: 1.5		
Marital status		
Single	189	43.4
Married	209	49.2
Divorced/Separated	13	3.0
Widowed	9	3.1
Non- response	5	1.2
Educational status		
No formal education	27	6.4
Primary	128	30.1
Secondary	171	40.2
Tertiary	89	20.9
Non-response	10	2.0
Occupation		
Civil servants	115	27.1
Traders	224	52.7
Farmers	21	4.9
Artisans	33	7.8
Students	30	7.1
Non-response	2	0.4

Table 2. Knowledge on solid waste

Knowledge	Frequency	%
Correct meaning of the term 'solid waste'		
Yes	355	83.5
No	70	16.5
Total	425	100.0
Know correct composition of solid waste		
Yes	398	91.5
No	27	9.5
Total	425	100.0
Know hazards of improper waste management		
Correct	351	82.6
Incorrect	73	17.2
Non-response	1	0.2
Total	425	100.0

Table 3. Relationship between educational status and knowledge of solid waste management

Educational Status	Knowledge of meaning of solid waste		
	Correct	Incorrect	Total
Nil	23	4	27
Primary	109	19	128
Secondary	136	35	171
Tertiary	79	10	89
Missing	8	2	10
Total	355	70	425
	$\chi^2= 4.149$	$p<0.05$	
Educational Status	Knowledge of Composition of solid waste		
	Correct	Incorrect	Total
Nil	21	6	27
Primary	95	31	128
Secondary	124	47	171
Tertiary	64	25	89
Missing	8	2	10
Total	312	111	425
	$\chi^2= 5.559$	$p< 0.05$	
Educational Status	Knowledge of hazards of improper waste management		
	Correct	Incorrect	Total
Nil	21	6	27
Primary	100	28	128
Secondary	144	27	171
Tertiary	79	10	89
Missing	7	2	10
Total	351	73	425
	$\chi^2=3.719$	$p< 0.05$	

4. Discussion

In this study, we found that residents of Onitsha metropolis have a good knowledge of solid waste, as more than eight out of every ten respondents studied gave a correct definition of the term 'solid waste.' About seventy percent, mentioned correctly the components of solid waste while 82.6% know the hazards of improper waste disposal. This agrees with the findings of the study in Nairobi city. [4] Also Modebe *et al.*, in a study in Awka the capital city of Anambra State, Nigeria, found that 95% of the respondents gave a correct definition of solid waste. [20] This can be attributed in part to the urban nature of the cities studied as improved economic condition and availability of social media thus influencing knowledge positively.

The current study also revealed a high literacy level (two thirds of the respondents had at least secondary level of education). This agrees with the findings of the survey on household knowledge of solid waste segregation in Urban Kampala which showed that about 61.3% of the respondents had attained at least secondary level of education. [11] Consequently, the high level of knowledge of waste management could be explained by the generally high educational status of respondents and maybe the ability to get information about waste management through the mass media.

There were statistical significant differences between educational level and knowledge of the meaning, components of solid waste, and hazards of improper solid waste management respectively. Reports based on available literature are consistent with this finding as has been posited by Adogu *et al.* [12] in Nigeria and Banga *et al.*, [11] in Uganda. In the Nairobi City study, the good knowledge of the meaning of solid waste reported, was significant at all levels of the socio- economic status (SES). [4] This contrasts with the results of the work done by Ajibade, who observed that knowledge of solid waste is acquired and transferred from generation to generation and not necessarily gained through formal education. [3] This variation may be as a result of differences in subject characteristics, study methodology and generalizations.

It is worthy of note that knowledge does not always guarantee practice. This agrees with the findings by Modebe *et al.*, in Awka, Nigeria. 20 A similar finding was made by Agwu in Port Harcourt. [21] Also a study on the waste management awareness, knowledge and practices among secondary school teachers in Ogun state Nigeria, reported that they were aware and knowledgeable about waste management even though their waste management practices were negative. [22]

Limitations and strengths of the study: This study is based on self-reports and is subject to social desirability bias. However, we took pains in explaining the essence of the study to the respondents.

5. Conclusions

The study results revealed that large numbers of Onitsha residents have a good knowledge of solid waste which has significant association with educational status. We therefore recommend regular and periodic health education on proper solid waste management patterns

targeted at attitudinal change on the residents. This should be organised by the local government authority with technical and other supports from the State and its agencies through seminars, radio, televisions, etc. to enable the residents translate their knowledge into practice as well as encourage strict adherence to appropriate waste management practices among them.

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Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

Author **OCA** and **OFE** were involved in the design and implementation, **CCN** was involved in analysis of data, interpretation of results and write up of this study, while **QNS** and **NFA** were involved in the design and editing of the main paper. All authors read and approved the final manuscript.

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