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Assessment of Waste Management Practices among Residents of Owerri Municipal Imo State Nigeria

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Abstract

Poor waste management has been a major problem to human existence and it affects both rural and urban areas. Various methods of waste disposal exist and this study assessed the waste management practices among residents of Owerri Municipal, Imo state, Nigeria. It was a descriptive cross sectional study in which a total of 282 residents of Owerri Municipal were selected by multi-stage sampling technique and studied using self and interviewer administered questionnaires. The results showed that 90% of respondents were aware of waste management while 97.5% had positive attitude towards it. The major types of waste generated from households were food residues (97.1%) and vegetable products (95.4%). Also poor waste management practices among residents include open dumping, practiced by 66.3% of the residents and burning as practiced by 62.4% of respondents. The commonest means of waste transport to final disposal site was by wheel barrow. Gender and educational status of respondents significantly influenced their knowledge, attitude and practice of waste management ($p < 0.05$). Good waste management is pivotal to sustainable healthy living conditions in any environment. The residents of Owerri need health education, regular supply of refuse collection facilities and designated final dump sites. These will encourage strict adherence to proper and appropriate waste management practices among them.

Keywords

Waste Management, Knowledge, Practices, Owerri, Nigeria

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1. Introduction

Waste management is the process of collecting, transporting, processing or disposing, managing and monitoring of waste materials. The term usually relates to materials produced by human activity and the process is generally undertaken to reduce their effect on health, the environment or aesthetics. The major focus of this research is on waste management practices as obtains in the urban developing nations. Waste includes all items that people no longer have any use for, which they either intend to get rid of or have already discarded and these include: packing items garden waste, old paints containers, vegetables, metals etc. [1]. Poor waste management has been a major problem to human health and existence, affecting both rural and urban areas. A clean environment influences good health and good health further affects the productivity of man. Therefore, it can be said that a good and clean environment invariably affects the wealth and economic status of the nation [2].

There are various methods of waste disposal including: land filling: which involves burying the waste in abandoned or unused quarries, mining voids or burrow pits and covering it with layers of soil; incineration: involves subjection of solid organic wastes to combustion at a very high temperature of about 10,000 so as to convert them into residue or gaseous products; open dumping: whereby dumping can be done on open land or sea; composting: this is an aerobic, biological process of degradation of biodegradable organic matter; hog feeding: this involves feeding animals like pigs with left over materials of waste; mechanical destructor: this involves the use of machines to destroy waste materials [3]. Recycling of waste which means taking waste materials and transforming them into raw products, results in saving natural resources, saving energy, reducing disposal costs, reducing harmful emission to air and water, saving money and creating jobs [4].

Awareness and knowledge of waste disposal is influenced by many factors as pointed out in a work done by Margaret Banga on household knowledge, attitudes and practices in solid waste segregation and recycling in urban Kampala. It indicated that the participation in solid waste separation activities depended on the level of awareness of recycling activities in the area, household income, educational level and gender [5]. Ayodeji Ifegbesan studied the waste management awareness knowledge and practices of secondary school teachers in Ogun state and it showed that teachers were aware and knowledgeable about waste management even though they possessed negative waste management practices [6]. There seems to be appreciable awareness and knowledge about waste disposal among people in Nigeria but most of them are only aware of the crude and traditional methods and are oblivious of the modern methods such as incineration and recycling [6]. The attitude of people towards waste management can be affected by their level of knowledge and awareness of waste management and it has been reported that homes with waste bins engage more in proper way of storing waste than homes without waste bins [7]. A Ghanaian study about attitude towards recycling and waste management showed no significant effect of gender, employment and educational statuses, on willingness to recycle [8].

Human wastes are great contributors of environmental health hazards. Poor waste practices lead to contamination of edible products thereby increasing the burden of infection and diseases among the citizens. About 1.3 billion tons of waste are generated globally, 0.035% being generated by Nigeria. About 85.8% of Nigerian waste is generated by households [9]. It is estimated that an average Nigerian in the urban or rural areas generates about 0.49 kg of solid waste per day with household and commercial centres contributing almost 10% of total urban waste burden. Of this about two thirds of wastes are dumped indiscriminately on the streets and in the drains thus posing serious environmental health hazards [10].

Furthermore poor waste management and disposal could lead to various diseases, infections and infestation and these include fly transmitted diseases like myiasis, diarrhoea, typhoid, cholera; rodent transmitted disease likelassa fever plague, leptospirosis, murine typhus; mosquito borne diseases such as malaria, yellow fever, filariasis, and dengue hemorrhagic fever [11]. Also gases like methane, carbondioxide, hydrogen sulphide and mercury vapour emitted from land fill site can constitute air contaminants and pollution [3]. Another problem people face in proper waste management and disposal is the absence of storage facilities (waste bins with tight fitted covers) in some houses which lead to littering of refuse around the house, worsened by the absence of drainage systems in such houses. Even where the drains are available they are either constructed without a gradient or not properly maintained as they are clogged or blocked with sand or other debris thus preventing sewage drainage.

Against the background of these identified problems, this research further assessed waste management practices, factors that influenced these practices and provided solution to avert/prevent the complications which arose from poor waste management. This research helped to ascertain the level of awareness, knowledge and at-

titude of people towards waste management practices. It also helped in finding out the prevailing methods of household waste collection and disposal system adopted by Owerri Municipal Council. It is hoped that the findings will enrich the reservoir of knowledge necessary to inform appropriate refuse management and environmental policy for the country.

2. Methodology

Study area: The study was conducted in Owerri Municipal which is one of the 27 local government areas of Imo State located in the south eastern part of Nigeria. Owerri Municipal is traditionally called Owerri Nchi Ise and has five indigenous kindreds which are: Umuorioronjo, Amawon, Umuonyiche, Umuodu and Umuoyima in the order of seniority. It is bounded in the North by Amakohia, on the North East by Uratta, on the East by Egbu, on the South East by Naze, on the South by Nekede and on the North West by Irette. It has on average temperature of about 27˚C (80˚F) [10]. Its vegetation is typically rain forest (although some parts consist of Guinea Savanna due to poor environmental management and pollution). According to the census result of 2006 conducted in the country, Owerri Municipal has a population of 127,213 inhabitants with about 17,000 households including shops and offices. Its inhabitants are mainly civil servants, traders and farmers who are predominantly native [11].

Study population: The population that was studied comprised of members of about 200 households in Owerri Municipal. The study included households who are residents in Owerri Municipal for atleast a period of one year.

Sample size determination: The sample size was calculated using Cochrane formular:

N = z^2pq/d; A minimum sample size of 280 was calculated, though the study sample size of 308 was obtained after the addition of an assumed 10% attrition.

Study design: This was a descriptive cross sectional survey on the pattern of household waste management practices among residents of Owerri Municipal, Imo State, Nigeria. Both self and interviewer administered semi-structured questionnaires were used.

Sampling techniques: The study was done using a multi stage sampling technique as follows: The 5 indigenous kindred served as the sampling frame from which 3indigenous kindred were selected using a simple random sampling technique. The 3 selected kindred were namely; Umuorioronjo, Umuonyiche and Umuoyima. Next, 3 residential areas (RAs) from each indigeniouskindred were selected using a simple random sampling technique which gives a total of 9 RAs as follows; Aladinma, Prefab, Louise Mbanefo, Ikenegbu, Douglas, Tetlow, Njemanze, Works Layout and New Owerri. By a simple random sampling method, the first household in each residential area was selected and the households were subsequently followed alternatively until all the households were exhausted.

Materials and process: The research instrument used was a semi-structured questionnaire which was constructed based on the research topic and objectives: Section A consisted of bio-data of the respondent while section B consisted of questions to assess their level of awareness and knowledge of waste management. Section C was aimed at assessing their attitude towards waste management. Section D consisted of questions to assess the type of waste management practiced and the means of transporting waste from collection centers to final disposal site.

Data analysis: Each completed questionnaire was reviewed for completeness prior to analysis. The data collected was sorted and analyzed with SPSS version 20. Tables, frequencies and percentages were generated where necessary.

Ethical consideration: Permission for this study was obtained from the Ethics Committee of Imo state University Teaching Hospital through the head, department of Community Medicine. Informed consent was gotten from the respondents and confidentiality of information was maintained.

Limitation of study: Some residents refused to open their gates or attend to the interviewers perhaps because of the precarious security situation in the state at that time. This setback was however largely circumvented by selection of well-known indigenes as guides for the interviewers.

3. Results, Tables and Figures

Three hundred and eight questionnaires were distributed but only 282 were collected and analyzed giving a response rate of 92%.

Table 1 shows that 43.9% (124) of the population were between the ages of 21 - 30 years and 3.9% (11) were

Table 1. Socio-demographic data.

Age (years)	Frequency	Percent
<20	11	3.9
21 - 30	124	43.9
31 - 40	97	34.4
41 - 50	34	12.1
>50	16	5.7
Total	**282**	**100**
Gender		
Male	102	36.2
Females	180	63.8
Total	**282**	**100**
Religion		
Christianity	274	97.1
Islam	5	1.8
Traditional	3	1.1
Total	**282**	**100**
Educational status		
No formal education	24	97.2
Primary School	32	11.6
Secondary school	56	19.9
Tertiary	170	60.3
Total	**282**	**100**

<20 years. Females were made up of 63.8% (180) of the respondents while 36.2 (102) were males. Also 97.2% (274) were Christians while 60.3% (170) had tertiary education.

In **Table 2**, majority of the respondents 90.1%, (254) were aware of waste management. Open dumping was the most popular method of waste disposal known to the respondents 279 (98.9%), followed by Burning 94.7% (267). Incineration recorded the least known waste disposal method. Majority of the respondents 97.5% (275) agreed that proper waste disposal can better their health and 98.9 agreed that the practice of waste management is of great importance. Also 99.3% (280) of respondents specified that waste management promotes good health and healthy environment. Majority of the respondents 91.5% (258) do not have licensed waste management firm in their area while only 5% (14) reported the presence of waste management policy in their local government. On overall attitude rating, 79.8% (225) had excellent attitude while 18.4% (52) had good attitude towards waste management.

Figure 1 depicts that the mass media (TV, radio, newspaper) was the commonest source of information 75.2% (212) on waste management, followed by neighbors 44.3% (125) community meetings recorded the least common means 3.9% (11).

Table 3 shows that majority of respondents collect their waste in containers with covers 51.4% (145) and 88.3% (249) do not separate their waste before disposal. About 50.4% (142) dispose their waste every alternate day. The commonest methods of solid and liquid waste disposal include open dumping 66.3% (187) and water carriage 86.2% (243) and water closet 95.4% (269) respectively. Majority of respondents 75.9% (214) said they had a centralized place for dumping solid waste while 28% (198) used the wheel barrow for transportation of waste to final dump site.

Figure 2 shows that the major type of waste generated from household is food residues (279), followed by vegetable (269) and papers/cartons (249).

Table 4 shows the effect of gender and education on knowledge, attitude and practice of waste management. Females are significantly more aware of waste management than males ($p = 0.025$). Females are also significantly more knowledgeable than males about open dumping ($p < 0.05$) while males know more about composting ($p < 0.05$) and land filling ($p < 0.05$). Females displayed better attitude to waste management than males with gradations, "good" ($p < 0.05$) and "excellent" ($p < 0.05$) significantly tilting in favor of the females. Males are more likely to carry waste with wheel barrow than females while the reverse is the case for hand carrying of waste, $p < 0.05$ each.
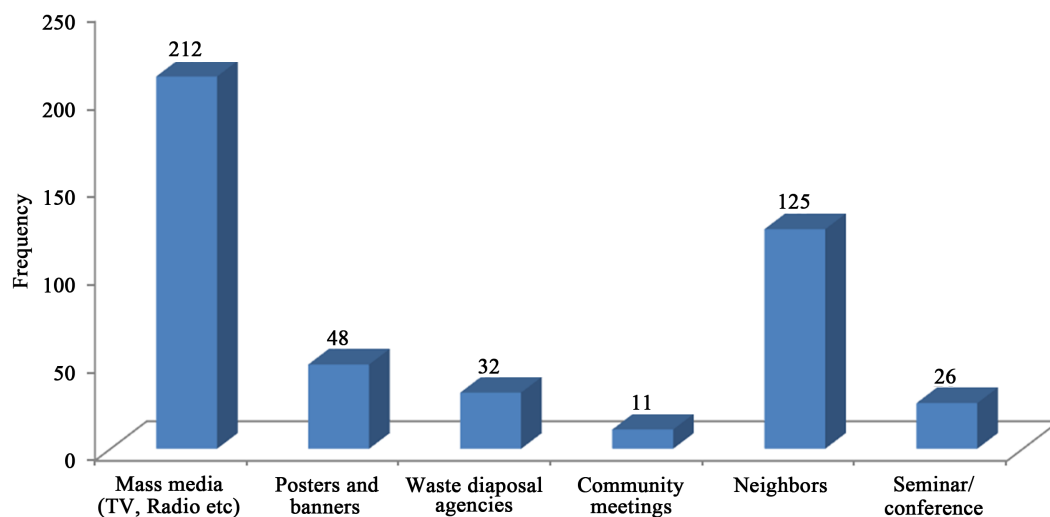
Figure 1. Source of information on waste management.

Table 2. Awareness, knowledge and attitude towards waste management.

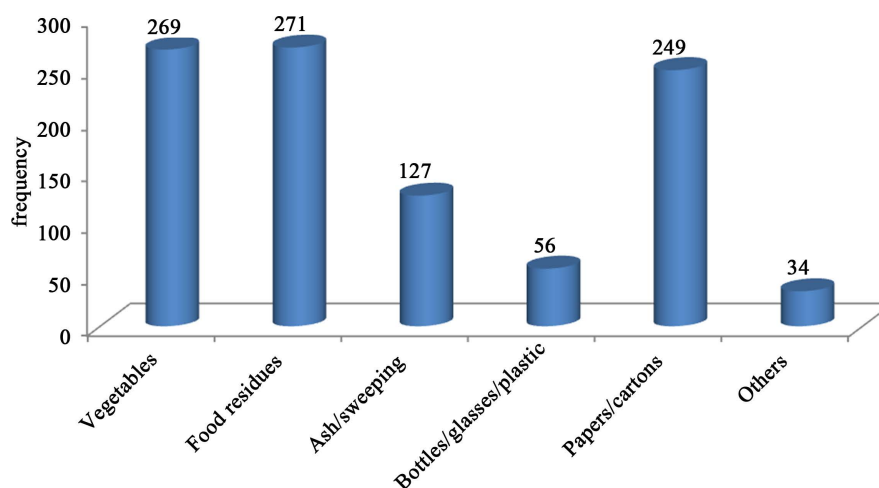| Responses	Frequency	Percentage
Awareness		
Yes	254	90.1
No	28	9.9
Total	282	100
Knowledge of waste management methods		
Open dumping	279	98.9
Burning	267	94.7
Burying	202	71.6
Composting	55	19.5
Land filling	43	15.3
Incineration	15	5.3
Attitude towards waste management		
Overall attitude		
Poor	5	1.8
Average/fair	8	18.4
Good	225	79.8
Excellent	275	97.5
Has effect on health	2	0.7
Has not effect on health	5	1.8
I don't know		
Specific attitude items		
Waste Management is important	279	98.9
I do not know if it's important or not	3	1.1
Waste management leads to good health	280	99.3
Waste management leads to healthy environment	280	99.3
Waste management leads to increased productivity	211	74.8
Have waste management plan/policy by the LGA	14	5
Have licensed waste management firm	24	8.5
Do not have licensed waste management firm	258	91.5
Had any form of training on waste management	11	3.9

Figure 2. Major types of waste generated in households of respondents.

Table 3. Waste management practices.

Practice items	Frequency	Percent
Method of waste collection		
Bags	97	34.4
Containers with covers	145	51.4
Containers without covers	40	14.2
Waste separation before disposal	33	11.7
No waste separation before disposal	249	88.3
Frequency of waste disposal in a week		
Every day	82	29.1
Every alternate day	142	50.4
Once a week	58	20.6
Method of solid waste disposal practiced		
Open dumping	187	66.3
Composting	26	9.2
Hog feeding	-	-
Burning	176	62.4
Burying	73	25.9
Land filling	-	-
Incineration	-	-
Others	31	11
Methods of liquid waste disposal		
Waste water		
Non-water carriage	39	13.8
Water carriage	243	86.2
Sewage		
Pit	7	2.5
Bucket system	-	-
Water closet	269	95.4
Others	6	2.1
Final dump site		
Presence of centralized dumping site	214	75.9
Absence of centralized dumping site	68	24.1
Method of waste transport to final disposal site		
Hand carrying	142	50.4
Closed trucks	13	4.6
Open truck	87	30.9
Wheel barrow	198	70.2
Pick up	79	28.0
Others	24	8.5

Table 4. Socio-demographic variables versus knowledge, attitude and practice of waste management.

Cross tabulations	X^2	*p*-value
Gender *versus*		
Awareness waste management	5.1[*]	$p = 0.025$
Knowledge of waste management methods		
Open dumping	3.9[*]	$p < 0.05$
Burning	1.1	$p > 0.05$
Burying	1.4	$p > 0.05$
Composting	4.3[**]	$p < 0.05$
Land filling	3.9[**]	$p < 0.05$
Incineration	1.7	$p > 0.05$
Overall attitude towards waste management		
Poor	2.1	$p > 0.05$
Average/ fair	2.5	$p > 0.05$
Good	4.7[*]	$p < 0.05$
Excellent	5.2[*]	$p < 0.05$
Has effect on health	2.8	$p > 0.05$
Method of waste transport to final disposal site		
Hand carrying	5.3[*]	$p < 0.025$
Closed trucks	1.4	$p > 0.05$
Open truck	1.7	$p > 0.05$
Wheel barrow	6.1[**]	$p < 0.05$
Method of waste collection		
Bags	2.2	$p > 0.05$
Containers with covers	1.9	$p > 0.05$
Containers without covers	1.3	$p > 0.05$
Waste separation before disposal	2.5	$p > 0.05$
No waste separation before disposal	4.1[*]	$p < 0.05$
Education versus		
Knowledge of waste management methods		
Open dumping	2.5	$p > 0.05$
Burning	3.2	$p > 0.05$
Burying	1.6	$p > 0.05$
Composting	4.5[†]	$p < 0.05$
Land filling	3.5	$p > 0.05$
Incineration	5.4[†]	$p < 0.025$
Method of solid waste disposal practiced		
Open dumping	4.6[††]	$p < 0.05$
Composting	3.3	$p > 0.05$
Hog feeding	1.5	$p > 0.05$
Burning and burying	4.1[††]	$p < 0.05$
Land filling	2.7	$p > 0.05$
Incineration	2.3	$p > 0.05$
Method of waste transport to final disposal site		
Hand carrying	5.1[††]	$p = 0.025$
Closed trucks	1.9	$p > 0.05$
Open truck	2.6	$p > 0.05$
Wheel barrow	5.7[††]	$p < 0.05$

[*]Significant in favor of females; [**]Significant in favor of males; [†]Significant in favor of higher education; [††]Significant in favor of lower education.

The educated respondents are significantly more likely than the less educated to dispose of waste through composting ($p < 0.05$) and incineration ($p < 0.025$). However the less educated are more likely to dispose of refuse by open dumping ($p < 0.05$), burning and burying ($p < 0.05$), and also more likely to hand carry refuse ($p < 0.025$) and transport refuse by wheel barrow ($p < 0.025$) than the more educated would do.

4. Discussion

4.1. Socio-Demographic Variables

Three hundred questionnaires were distributed while only 282 were collected and analyzed giving a response rate of 92%, the remaining 8% were not analyzed due to inappropriately filled responses and missing questionnaires. Majority of the respondents were aged between 21 - 30 years (43.9%), followed by ages of 31 - 40 (34.4%), the age range of <20 years (3.9%) recorded the least occurrence. One hundred and eighty (63.8%) of respondents were females while 102 (36.17%) were males. The preponderance of female respondents in this study is a reflection of higher level of interest expressed by the female gender as reported in a qualitative study of preference for house hold tasks [12]. Men commonly reported how they enjoyed being outside in the garden, or alternatively, how they did not expect their partners to be able to look after the grounds as well as them [12]. However, women commonly reported performing the jobs of mowing the lawn or taking out the rubbish better than their partners, and as a result, assumed the responsibility of completing these tasks themselves [12].

The current study also revealed that a sizeable number of the respondents 170 (60.3%) had tertiary education, secondary school education 56 (19.86), primary school education 32 (11.4%) and just about 24 (8.5%) with no formal education an indication of a high level of educational status. This is unlike the work done by Margaret Banga on household knowledge of solid waste segregation in Urban Kampala which showed that only about 17.5% of the respondents had attained tertiary level education and 43.8% attained secondary level education, while 30.5% had primary education. Consequently, the high level of awareness 254 (90%) of waste management could be explained by the generally high educational status of respondents and the commonest (75.18%) source of information about waste management was through the mass media (TV, Radio, newspaper). Furthermore, this result is in line with the findings of work done by Adeyemo and Gboyesola [7] on knowledge, attitude, and practices on waste management of people living in the university area of Ogbomoso which indicated that the respondents were knowledgeable in refuse management.

4.2. Awareness, Knowledge and Attitude towards Waste Management

The most popular methods of waste disposal known to the respondents were open dumping (27.9) (98.94%) followed by burning 267 (94.68) while the least known method was incineration. This scenario is not very different from findings in other studies. Open dumping remains the simplest and the most commonly used method for disposing municipal solid waste [13]. In most low to medium income developing nations like Nigeria, almost 100 percent of generated waste goes to landfills [14]. In spite of the recycling and composting of greater amounts of municipal solid waste in the United States in the last couple of years, the majority of waste generated still end up in landfills [15]. While wastes are deposited in open dumps in developing nations; these have become obsolete in the developed countries. Sanitary landfills which are well engineered facilities (with liners, leachate collection/ treatment system, and gas collection system) are now used to ensure the protection of human health and the environment. These modern landfills are often under strict federal and state regulations and are therefore specially sited, designed and operationalized to ensure environmental performance [15]. However, it is different in some parts of Nigeria, where the unsanitary landfills are not subject to regulations, and are usually sited for convenience, such as the presence of a pre-existing hole (created from sand mining activities) into which waste could be deposited [14]. In Lagos, Nigeria, some of these open pits are located near residential housing and therefore represent a threat to human health and the environment. Also a South African study has found that out of the 5 million tons of waste produced every year, only 5% is disposed of in designated sites, which implies that most of the waste in that country is deposited in environmentally unsafe sites [16].

A large number of the respondents had a positive attitude towards waste management as 275 (97.5%) of the respondents agreed that proper waste disposal can better their health and 279 (98.9%) believed that the practices of waste management is of great importance. Also 280 (99.3) of respondents specified that waste management promotes good health and healthy environment. This is line with the study carried out by Adeyemo *et al*. [7] which showed that respondents in university area of Ogbomso had a positive attitude towards waste manage-

ment as 82.0% agreed that waste disposal into drains and around the surroundings is unhealthy and can be disastrous to health.

4.3. Household Waste Type and Waste Management Practices

This study also showed that the major type of waste generated from households was food residues 271 (97.1%), followed by vegetable 269 (95.4%). This is similar to findings of the work done by Modebe *et al.* [17] on household solid waste management in Awka in which the commonest type of waste generated was garbage (100%), followed by cellophane bags (99%). It is however different and higher than the household waste generated in the City of Johannesburg, South Africa in which 67% were household wastes, 23% from commercial activities and 10% industrial activities [16].

A good number of our respondents 145 (51.4%) collect their waste in containers with covers and majority do not separate their waste before disposal; 249 (88.3%). This is in line with outcome of study done by Modebe *et al.*, which reported that 85% of households in Awka stored their waste in closed containers outside the house and majority of the respondents (87.8) did not sort their waste prior to disposal. A study in South Africa recorded a similar finding that waste collected is not sorted into recyclables or non-recyclables and is all disposed of at the final dumpsite with no sorting [16]. A recycling programme could be introduced by the authorities as studies have shown that 60% of waste generated in the households can be recycled, if proper waste recycling system is put into place.

This study has created a general picture of poor waste management practices among residents of Owerri Municipal because 66.3% of respondents practiced open dumping while 176 (62.4%) preferred to burn their wastes. These are not ideal since they constitute potential sources of infection, air pollution as well as constitute aesthetic blithe. This finding however does not agree with the Modebe *et al.* study [17], which showed that majority of the respondents in Awka (73%) disposed their waste through government waste management agency and only 27% dumped theirs in unauthorized area. This is an indication that the residents of Awka enjoy the benefit of existing strong and functional government waste management agency. The result is a better coordinated waste management practice in Awka than obtains in Owerri Municipal.

Majority of the respondents (75.9%) have a centralized place for dumping solid waste and the commonest means of transports of waste was by wheel barrow (70.2%). This finding is however at variance with what obtains in South Africa where domestic waste is collected weekly from households by the Municipality trucks [16]. About 91.4% of our study respondents do not have licensed waste management firm in their area. To worsen an already bad situation, almost all the respondents (96.1%) have not had any formal training on waste management and 95.0% of respondents do not have waste management plan/policy provided by the local government area/council. This unfortunate situation is an indication of the lack of political will and commitment towards such important statutory function and activity of the local governments, aggravated by total absence of plan for storage, collection, transportation and final disposal of waste in the area.

In this study, females were found to be more aware and knowledgeable about waste management than males. A Togolese study on the intersection of gender, education and health, recognizes the pivotal role of women in household cleanliness and sanitation [18]. It is therefore not surprising that the female respondents knew so much about basic waste management principles.

5. Conclusions

The study was carried out in Owerri Municipal and considered the waste management practices among the residents. It looked at the level of awareness and knowledge, attitude towards waste management and the methods of waste disposal.

The study found that large numbers of the residents were aware of waste management and also knowledgeable about various methods of waste disposal. Majority of the residents had a positive attitude towards proper waste management, even though there was evidence to the contrary considering the discovery that the most prevalent methods of disposal were open dumping and burning. These are inappropriate as they pollute and constitute aesthetic blithe in the environment.

Proper waste disposal management is essential to sustain healthy living conditions in any environment. Strict adherence to appropriate waste management practices in any community will insulate the inhabitants from detrimental and hazardous environmental conditions and improve the living standard of the people.

6. Recommendations

1) Waste management policy; a proper waste management policy should be formulated and implemented. This policy should promote new healthy methods of waste disposal like recycling and incineration while phasing out the old and unhealthy methods like open dumping and burning which still predominates.

2) Government through federal and state ministries of Health and Environment should provide mediums either through seminars, radio, televisions etc. and incorporating health practices as a subject in the educational curriculum of schools that can improve the knowledge of waste management practiced among individuals in the community.

3) Government should also make adequate efforts to provide means of ferrying collected waste from the point of collection to the final dump site; this will help to reduce the common practices of open dumping by individuals. An example is the Lagos state, Nigeria waste management authority provision of private sector participation ("PSP") trucks that visit communities (at no cost) to ferry collected waste to dump sites.

4) The above recommendation cannot be put in place without adequate funding and political will, in order to acquire better waste management equipment like incinerators, mechanical destructors etc.

7. Future Research

A cohort study to determine the "relationship between waste management practice and some health indices among residents of urban and rural communities in south eastern Nigeria" will be carried out in future. The current study findings will serve as pilot, baseline and springboard for the proposed larger and more advanced research. The result of this proposed research will hopefully add to the evidence and justification for implementation of the afore-mentioned recommendations.

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