

## **Determinants of Proper Disposal of Plastic Waste among Health Workers at Chukwuemeka Odumegwu Ojukwu University, Amaka, Awka, Anambra State**

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### ***Abstract***

*Improper disposal of plastic waste has been a huge global environmental issue over time. With the emergence of COVID-19 and high prevalence of various infectious diseases, production of single use personal protective equipment escalated. And they are mostly made of plastic, making plastic waste from healthcare services increase tremendously. These plastic wastes from the hospital may contain infectious or toxic substances that pose a significant threat to health workers, waste handlers and to the public at large for those that will come in contact with the waste if improperly disposed. The drastic increase in medical plastic waste is overwhelming the environment and so, has been tagged a major environmental burden. As a result, medical facilities are called upon to look into their waste management protocol to ensure they are safely disposing their waste to avoid infection of the public and waste handlers and also to ensure environmental safety.*

*This study is to determine the proper disposal of healthcare waste among healthcare workers in Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Amaku, Awka, Anambra State. This study was carried out using a sample size of 712 staff. Simple random sampling without replacement was used in order to avoid obtaining a bias response. The association and predictability of the dependent variables by independent factors were determined statistically using Chi-square and regression methods, respectively.*

*From the findings of the study, it was observed that 302(42.4%) of the total respondents used and disposed of their plastic wastes properly, whereas 410 (57.6%) disposed of their plastic waste improperly. Improper disposal of medical waste could be as a result of unavailability of proper means of waste disposal, bad or no healthcare management policy on waste management and other factors.*

*Healthcare workers are advised to make use of proper means of plastic waste disposal so as to avoid the negative effects of improper disposal of medical plastic waste on both the environment and human.*

***Keywords:*** Proper Disposal of Plastic Waste; Health Workers; Anambra State

## Introduction

Plastics are made up of synthetic organic polymers which are widely used in different applications ranging from water bottles, clothing, food packaging, medical supplies, electronic goods, construction materials, etc. (1) Plastic waste (PW) is a typical industrial waste, and its disposal into landfills creates serious environmental concerns. (2) Combating the menace of plastic waste pollution has become a global environmental challenge. (3)

Hospital waste generally consists of medical waste and non-medical waste (Nasution and Mahyuni, 2020). Healthcare waste or medical waste, according to Elekeh et al (2021), includes waste generated within healthcare facilities, blood banks and collection services, nursing homes for the elderly, research institutes, mortuary and autopsy centres, and laboratories related to medical procedures. It also includes the same types of waste that come from minor and dispersed sources, such as waste generated during home health care (e.g., home dialysis, self-administration of insulin, recuperative care). (4) Based on its nature, the concentration and amount of hospital waste can be detrimental to health and can pollute the environment as it can be infectious, toxic or radioactive (Nasution and Mahyuni, 2020).

Due to the persistence and high contagiousness of SARS-CoV-2 virus, many countries are classifying all hospital waste as infectious (5). As a result, they pose a significant threat to the environment and public health, first to the healthcare worker, then to the waste handler, and finally to anyone who may come into contact with them as a result of improper or poor disposal. (4) It has been documented that the waste produced in the course of health-care activities carries a higher potential for infection and injury than any other type of waste (5).

About 85% of the waste produced by health-care providers is comparable to domestic waste and usually called “non-hazardous” or “general health-care waste”. It comes mostly from the administrative, kitchen and housekeeping functions of health-care facilities and may also include packaging waste and waste generated during construction and maintenance of health-care buildings. The remaining 15% of health-care waste is regarded as “hazardous” and can pose a number of health and environmental risks (9).

In 2020, the global plastic pollution enhanced due to the use of PPE, such as medical masks and gloves, by medical staff and health workers, and later on by ordinary citizens. (7) and their subsequent mismanagement of personal protective equipment (PPE) and other necessary medical waste to manage the COVID-19 pandemic, with a monthly estimated use of  $129 \times 10^9$  face masks and  $65 \times 10^9$  gloves. (6) The dramatic increase in medical waste is overloading the capacity of each country or municipality, to manage/treat it adequately. (7) Environmental pollution by plastic wastes is now recognized widely to be a major environmental burden, especially in the aquatic environment where there is prolong biophysical breakdown of plastics, detrimental negative effects on wildlife, and limited plastic removal options. (1)

Safe health-care waste management is fundamental for the provision of quality, people-centred care, protecting patient and staff safety and safeguarding the environment. (9) Poor management of health-care waste exposes health-care workers, waste handlers and the community to infections, toxic effects, and injuries. There is also a potential for spreading drug-resistant microorganisms from health-care facilities into the environment through poor health-care waste management. (9) Healthcare waste can cause disease and injury if it contains infectious waste, sharps, harmful chemical waste, or radioactive waste. (10) Poor management of healthcare waste can thus endanger healthcare workers and the public. Improper disposal of these wastes could also lead to environmental problems. (7) According to WHO (2014), management of healthcare waste involves waste segregation, collection, storage, treatment, transportation, safe disposal and monitoring of these activities (WHO, 2014).

Nigeria has policies and regulations that protect public health and the environment, including a national policy on the environment as well as a national environmental sanitation policy. Nigeria is also a signatory to an international treaty called the Basel Convention which regulates the movements of hazardous waste between nations. (10)

However, not all medical facilities observe the policies and regulation. As such, this research is aimed at determining the proper disposal of health-care wastes among health care workers in Chukwuemeka Odumegwu Ojukwu University, Amaku, Awka, Anambra State.

## **Materials and Methods**

### **Study Design**

This study was carried out in Chukwuemeka Odimegwu Ojukwu teaching a hospital Awka, Anambra state. The study design was cross-sectional study, recruitment of participants both simple random sampling and systematic random sampling were adopted. Out of 767 of the sample estimated 712 participated in the study which is 92.8% return rate of the questionnaire.

### **Inclusion criteria**

- i. Health workers who were present at the working place
- ii. Health workers who were willing to participate in the study

### **Exclusion criteria**

- i. Health workers who were absent
- ii. Health workers who were not willing to participate in the study.
- iii. Health workers who were sick.

Trained clinical students were trained for 3 days on the questionnaire and distribute questionnaire between 15<sup>th</sup> July and 22<sup>nd</sup> July 2022

### **Study Population**

Sample size was estimated using the below formula

$$n = \frac{z^2 p(1 - p)}{e^2} * E$$

n= Sample size required

z= Confidence interval 1.96

p= Proportion of study carried out at Chukwuemeka Odimegwu Ojukwu teaching hospital Awka to find the proper disposal of plastic waste is 65%.

E= Design effect (factor) to remove bias (2)

A= Attrition 10%

Therefore,

$$n = \frac{(1.96)^2 * 0.65 * 0.35}{(0.05)^2} * (2) = 766.177$$

Which is approximately 767.

The estimation of the sample size was approximately 767 staff from which 712 participated in the study. Sample size was proportionally distributed before obtaining the number of staff and to be surveyed within the hospital.

### Data Collection and Analysis.

To learn more about the hospital's methods for handling the plastic waste produced by the hospital, semi-structured questionnaires were distributed to in different department of the hospital. Age, the hospital environment, the volume of plastics used daily, the presence of disposal facilities, etc. were the main focus areas of the questions. These data were gathered in order to offer crucial empirical proof of the factors that other studies have identified as contributing to plastic waste contamination. The goals of the study cannot be fulfilled without these data. The association and predictability of the dependent variable by the independent factors, as given in Tables 1 and 2, were determined statistically using the chi-square and regression methods, respectively. A desk study approach was employed to review pertinent material for the study in order to speed up the analysis process.

### Result and Discussion

The study findings focused on how respondents derived proper and dangerous strategies for disposing of their plastic garbage, relying on Wilson et al recommendations. Additionally, it draws attention to the connection between the sociodemographic traits of the respondents, other pertinent aspects, and the disposal of plastic garbage. The results further confirmed the statistical causes of respondent's proper plastic trash disposal in the research area.

**Table 1: Analysis of determinant of plastic waste disposal at Chukwuemeka Odimegwu Ojukwu teaching hospital**

	Disposal of Plastic Waste	X <sup>2</sup> Statistic	P-value
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<b>Respondents Age</b>		Proper	Improper		
	≤ 25 Years	113	157	1.98	0.471
	26-30 Years	101	135		
	≥ 31 Years	89	117		
<b>Education Qualification</b>					
	Tertiary Education Completed	171	108	27.09	0.031*
	Secondary Education Completed	139	123		
	Primary Education Completed	81	68		
	Not Educated	13	9		
<b>Hospital Environment</b>					
	Tidy	180	243	18.71	0.003*
	Untidy	82	206		
<b>Vol of Plastic Waste per day</b>					
	≤ 50%	195	176	12.20	0.006*
	≥ 50%	96	245		
<b>Availability of waste disposal</b>					
	Yes	114	271	21.72	0.017*
	No	91	236		
<b>Existence of sanitary unit</b>					
	Yes	118	267	33.91	0.000*
	No	97	230		
<b>Existence of healthcare waste management policy</b>					
	Yes	170	253	1.32	0.817
	No	88	200		
<b>Availability of healthcare waste management plan</b>					
	Yes	185	242	4.52	0.011*
	No	112	173		
<b>Knowledge</b>					
	High	109	161	14.81	0.003*
	Average	90	116		
	Low	105	131		
<b>Attitude</b>					
	Good	97	119	19.14	0.021*
	Fair	117	126		
	Not good	74	179		

According to other researchers' suggestions that there are many factors that contribute to proper waste disposal, the chi-square analysis brought attention to the relationship between proper

plastic waste disposal and sociodemographic characteristics of the respondents as well as other external factors. Additional factors that were considered includes hospital environment, the volume of plastics in total waste generated daily, the availability of waste disposal facilities, the availability, knowledge, attitude, practices of respondents, etc.

From the findings, Table 1 provides the statistically significant ( $p \leq 0.05$ ) relationship between the hospital environment, volume of plastic waste per day, availability of waste disposal, existence of sanitary unit, availability of healthcare waste management plan, knowledge, attitude, and proper plastic waste disposal at  $p < 0.05$ .

**Table 2: Regression of determinants of proper plastic waste disposal.**

Determinant	B	S. E	t-Statistic	Df	P-value
Respondents Age	0.167	0.221	0.756	1	0.314
Hospital Environment	2.376	0.523	4.543	1	0.003*
Vol of plastic waste per day	0.708	0.617	1.147	1	0.087
Availability of waste disposal	1.421	0.329	4.312	1	0.013*
Existence of sanitary Unit	0.786	0.336	2.339	1	0.004*
Existence of healthcare waste management policy	-0.334	0.192	-1.739	1	0.065
Availability of healthcare waste management plan	-0.221	0.122	1.811	1	0.041*
Knowledge	0.967	0.389	2.485	1	0.000*
Attitude	0.546	0.215	2.539	1	0.001*

### Analysis of Determinants of proper Plastic Waste Disposal.

The findings in Table 2 show that hospital environment, availability of waste disposal, existence of sanitary unit, availability of healthcare management plan, knowledge and attitude are statistically significant determinants of proper plastic waste disposal at  $p \leq 0.05$  respectively. However, respondents age, the volume of plastic waste, and existence of healthcare management policy are not significant determinants of proper plastic waste disposal.

**Table 3: Plastic waste disposal method within the teaching hospital**

Open Dumping of Waste	Truck pickup by health care waste management unit	Burning of the waste
243 [34.1%]	312 [43.8%]	157 [22.1%]

From the findings of the study, it was observed that 302 (42.4%) of the total respondents used and disposed of their plastic waste “proper,” whereas 410 (57.6%) disposed of their plastic waste “improper.” The categorization indicated above was derived from the respondent’s choices of disposal methods.

The delivery of healthcare must include effective waste management. Strong healthcare facility administration and organization are crucial for effective waste management in the industry. Hospital staff, waste handlers, the community, and the environment are all exposed to diseases, harmful effects, and injuries as a result of improperly managed hospital waste. In this cross-

sectional study aimed at determining the proper disposal of plastic waste among health workers at Chukwuemeka Odimegwu Ojukwu teaching hospital.

The majority of study participants were under the age of 25, followed by those between the ages of 26 and 30. According to the study, the hospital environment is generally clean, and less than or equal to 50% of plastic trash is generated daily. The hospital's sanitary units are accessible, according to the health professionals.

The ratio of waste handlers to all health workers is 2:4.5, and according to other instruments employed in this study, they are likewise the least cadre of employees. The majority of health professionals have been working for less than five years, demonstrating their inexperience. There is a lack of knowledge regarding healthcare waste notwithstanding educational status, as evidenced by the study's finding that 62.0% of respondents had tertiary level education.

### **Conclusion**

The high demand and consumption of plastic products currently, is having a great toll on environmental safety and health of both animals and human alike. This is due to the improper disposal of plastic waste. Healthcare facilities are one of the major users of plastic products, giving rise to environmental mayhem from improper disposal of plastic waste. This study determines the factors that affect the proper disposal of medical waste among health workers. So, it was observed that factors like structure, management and knowledge contribute greatly to the disposal of plastic waste among healthcare workers.

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