EVALUATION OF WASTE DISPOSAL PRACTICES IN PRIMARY HEALTHCARE FACILITIES IN RURAL COMMUNITIES OF NIGERIA.

ABSTRACT

Background: Medical waste, also referred to as healthcare waste, has been defined by the World Health Organization (WHO) as "all the waste generated within healthcare facilities, research centers, and laboratories related to medical procedures; including the same types of waste generated from other scattered sources and homes".

Objectives: The main aim of this project was to assess waste disposal practices in Primary health facility in Esan Central Local Goverrnment Area in Edo State.

Methodology: This was a cross-sectional study carried out among 65 staff members among primary health care facilities in Esan Central Local Government in Irrua, Edo state. The study involved using a simple random sampling technique.Data was analyzed using IBM SPSS version 21.0 software for descriptive statistics. The Chi square test was used to test for association and the level of significance was set as $p < 0.05$.

Results: The study showed that majority of the participants (87%) had a good knowledge on health care waste management. Incineration (70.5%) is identified as the main method of disposal of waste along with sanitary landfill. As regards knowledge of the risk of poor disposal method, it was seen that the majority of the participants had good knowledge (85%) on the risk and negative impact this will have on people and the community at large.

Conclusion: In this study, there was good knowledge on waste management and the participants understood the risk involved when there is poor management of waste.

KEY WORDS: Waste, Health, Hazard.

ABBREVIATIONS

HCW: Health Care Workers

WHO: World Health Organization

PHCs: Primary Health Centers

HCWM: Health Care Workers Management

INTRODUCTION

1.0 BACKGROUND

Medical waste, also known as healthcare waste, is defined by the World Health Organization (WHO) as "all waste produced within healthcare facilities, research centers, and laboratories associated with medical procedures. This definition also encompasses similar types of waste generated from various other sources and homes." [1,32,33,34].

The establishment of healthcare services is fundamental to every advanced society. Treating outpatients and hospitalized patients involves the use of food, medicines, chemicals, equipment, and instruments, which produce various types of waste. Waste generated from the treatment of patients with infectious diseases can spread infections, either through direct contact or indirectly through the environment. This issue is a global concern, and appropriate waste management systems are being developed and implemented to address it [1].

Healthcare facilities produce various types of waste, some of which resemble household waste, while others include blood-contaminated products, human anatomical waste, and non-human anatomical waste. Medical waste encompasses all waste generated by healthcare establishments such as hospitals, clinics, doctors' offices, dental offices, veterinary offices, as well as other medical laboratories and research facilities [2]. Despite the waste generated, the transportation of bio-hazardous materials from hospitals to proper disposal sites is increasingly becoming a big issue. Due to the hazardous nature of healthcare waste, special care must be taken in its collection, storage, and disposal to prevent the transmission of infectious diseases such as HIV/AIDS, hepatitis B, and hepatitis C, as well as to avoid environmental contamination [3].

The disposal of hazardous healthcare waste is complex because each item must be handled according to specific guidelines to ensure the safety of patients, healthcare personnel, staff, and the general public. Healthcare waste management involves seven crucial steps: segregation (preferably at the source), collection, storage, handling, transportation, treatment, and disposal. Proper identification of healthcare waste at the source is essential, as it must be placed into designated containers and subsequently disposed of through methods such as incineration, sterilization, chemical disinfection, or burial in a secured landfill [3].

The insufficient equipment to manage the growing volume of medical waste has led to the dumping of significant amounts of waste in illegal sites and occasionally burning within the premises of health facilities [4]. Uncontrolled burning of this waste can cause air pollution and release toxic emissions from incomplete combustion, posing a hazard to public health [5].

Over the past 30 years, the volume and rate of healthcare waste generation have dramatically increased due to the rising number of medical centers and hospitals worldwide [6]. Ineffective and inefficient waste management practices are among the most pressing environmental issues in many developing world cities. In Nigeria, a prime example of a developing country, many people are unaware of the significant contribution healthcare waste makes to pollution. This lack of awareness is evident in the absence of specific policies to address the dangers posed by harmful and infectious waste from healthcare facilities [7].Currently, there is no specific system in place to ensure the separation of infectious and non-infectious waste at the source. As a result, infectious waste often gets mixed with other types of waste and is typically disposed of with municipal waste, leading to various hazards [8].

The occupational health effect of medical and other hazardous waste depends on the duration of exposure of the hazardous waste on the body of the victim. It also depends on the dose of toxic compounds that enter the body from the waste.Unmanaged hospital waste constitutes hazards to the human body through different routes of exposure thus causing ill health and economic loss. Injuries and accidental cuts due to handling of medical waste that contained sharps and needles are common with municipal waste workers that handle hospital waste. Contacting diseases due to handling contaminated infectious waste are common as well [9].

It has been observed that patients are frequently the victims of poor waste management practices. For example, one global study of waste management found evidence that approximately 30% of injections administered in one country were performed with previously used equipment. This is due to the fact that the previously used equipment is not properly disposed of and can be easily picked and used again [10]. The waste procurement staffs that collect and dispose of healthcare waste are often at great risk of being exposed to infectious agents. In health care facilities, medical waste handlers experience contamination of their clothing with either blood or body fluids. Additionally, clinical waste staffs around the globe are generally poorly trained not only in infection control procedures but also on the importance of preventing infections in themselves [10].

There are frequent episodes of improper dumping of medical waste including placing infectious materials into general municipal waste where it later injures scavengers which will lead to transmission of some infections. It is unknown how many of these scavengers will ultimately contract HIV or hepatitis because of ignorance and lack of follow-up procedures[11]. The spread of HIV, hepatitis B and C, and multidrug resistant organisms through waste objects multiplies the impact of these infectious agents as they spread from patient to practitioner to waste handler and ultimately, back to the public. Careful strategic planning is required in order to minimize the infectious potential of healthcare waste [12].

Also, open burning of these medical wastes, releases significant amounts of greenhouse gases into the atmosphere. Such compounds include; carbon dioxide, methane and particulate which are typically associated with air pollution and can lead to or aggravate severe cases of respiratory disease like asthma, bronchitis and emphysema [13].

Numerous studies have been done on the assessment of waste disposal practices in health facilities especially primary health centers and secondary health facilities in various countries and even in Nigeria. However, not enough studies on the assessment of waste disposal practices in primary health centers and secondary health facilities in Esan central local government area, Edo State has been done. Taking a tour around the health facilities in Esan central, the lack of proper waste management systems like incinerators, autoclave and even sharp boxes lead to the indiscriminate dumping of waste from health centers. As a result, this waste is easily accessible to the community. Not only are the communities affected but also the medical practitioners, the current patients, the future patients and the waste handlers. Seeing this problem of neglect, it is in this light that the researcher developed the interest in assessing health care waste management practices in primary health facilities in Esan Central Local Government Area of Edo State. The results from this study will be used to improve the health care waste management practices and will also provide empirical data to policy makers, researchers and other bodies concerned about developing effective waste management policies in Edo state and the country at large. This study will also impact knowledge on the healthcare workers and waste handlers on proper waste management in health facilities so as to prevent the harmful effects of poor waste management.

The main aim of this project was to assess waste disposal practices in Primary health facilities in Esan Central while the specific objectives in the study were:

1. To determine the prevalence of the type of waste products generated.
2. To assess the knowledge of health workers on healthcare waste management practices.
3. To assess how health care waste isdisposed of by healthcare facilities.
4. To assess knowledge on the risk of poor waste disposal practices among health workers.

METHODOLOGY

2.1 STUDY AREA

This study was carried out among primary health care workers in Esan Central Local Government Area which is one of eighteen Local Government Areas in Edo state. The primary health centers constitute health workers which may include visiting doctors, nurses, mid wives, laboratory attendants, pharmacists, and orderlies. Their duty is to bring health care to the grass roots which include the rural communities where they are found.

2.2 STUDY DESIGN

A descriptive cross-sectional study was employed for this research.

2.3 STUDY POPULATION

The study participants were primary health care workers working in the seventeen primary health care centers of Esan Central Local Government Area, Edo state. They include nurses, community health extension workers, health attendants, health assistants and messengers.

2.4 METHOD OF DATA COLLECTION/INSTRUMENT

The information was collected from respondents using a self-administered structured questionnaire adopted from the WHO, and prepared by the researcher through extensive literature search and consultation with experts. The questions were in simple English language, short and direct to prevent misunderstanding, focusing on assessing waste disposal practices in Primary health centers and Secondary health facilities in Esan CentralLocal government Area. The questionnaire was adapted from the WHO questionnaire.

2.5 POPULATION SIZE

A total population survey was done using the primary health care workers working in the seventeen primary health care centers in Esan central local government area.

2.6 SAMPLING TECHNIQUE

A simple random sampling technique was employed in this study whereby the questions were distributed to the participants who fit the criteria at random.

2.7 SAMPLE SIZE ESTIMATION

Sample size was estimated using Cochran's formula for cross sectional surveys

Sample size $n = \frac{Z^2Pq}{d^2}$

n= Sample size

Z = Standard normal deviation, set at 1.96 to correspond to 95% confidence interval.

P = Prevalence of condition under study taking from the highest value in the literature in previous studies.

q = 1-P

d = Error margin allowed from the study which is a measure of level of accuracy.

For this study;

Z = 1.96

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P = 96% i.e. 0.96 (prevalence value on Health Care waste disposal in Saudi Arabia [25])

d = 0.05

From the formula above

$$\text{Sample size } n = \frac{Z^2Pq}{d^2}$$

$$\text{or } n = \frac{Z^2P(1-P)}{d^2}$$

$$n = \frac{(1.96)^2 \times 0.98 \times (1-0.98)}{(0.05)^2}$$

$$n = \frac{3.8416 \times 0.96 \times 0.04}{0.0025} = \frac{0.14751744}{0.0025}$$

n =59.0

From the calculation above, the estimated sample size is 59.

Attrition or non-response rate = 10% of sample size

$59 \cdot \frac{10}{100}$ = 5.9 app. 6

10% of sample size was added to cover for possible non-response during the course of study. Therefore, the estimated sample size is 59+ (10% of 59) =5.9+59= 64.9

The estimated sample size is 65 respondents.

2.8 DATA ANALYSIS

Statistical test of association between proportions was done by the use of appropriate test of statistics. Statistical level of significance was set at $p<0.05$. Association between the dependent and the independent variable was tested using the Chi-square. The data was analyzed using the descriptive statistical methods which were represented in frequency distribution tables, percentage and pie-chart.

2.9 ETHICAL CONSIDERATION

Ethical approval was sought from Irrua Specialist Teaching Hospital Ethics Committee. Ethical approval for the study was also sought from the ethical review board, Irrua Specialist Teaching Hospital.

Permission was obtained from the Primary Healthcare Department Coordinator of Esan Central Local Government Area while informed consent was obtained from the participants. The purpose of the research was explained to the respondents as best as possible and they were made to understand that information gotten was strictly confidential. They were assured that the information gotten were stored in files and kept away from authorized access and soft copy, stored in pass worded laptops.

4.1 RESULTS

INTRODUCTION

This chapter deals with the analysis of collected data and presentation of results with the use of percentage, frequency tables and charts. A total of 65 questionnaires were distributed but 61 were retrieved giving a response rate of 93.8%. The results were analyzed under the following sub-headings:

TABLE 1: SOCIAL DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

VARIABLE	FREQUENCY N=61	PERCENTAGE
AGE IN YEARS		
11-20	8	13.1
21-30	25	41.0
31-40	13	21.3
41-50	13	21.3
51-60	2	3.3
MEAN±S.D	**31.6±10.6**	
SEX		
MALE	10	16.4
FEMALE	51	83.6
MARITAL STATUS		
SINGLE	41	67.2
MARRIED	14	23.0
DIVORCED	6	9.8
LEVEL OF EDUCATION		
PRIMARY	4	6.6
SECONDARY	9	14.8
TERTIARY	48	78.6
RELIGION		
CHRISTIAN	53	86.9
ISLAM	7	11.5
TRADITIONALIST	1	1.6

DESIGNATION		
DOCTOR `	3	4.9
NURSE	40	65.6
PHARMACIST	3	4.9
LABORATORY TECHNICIAN	4	6.6
ORDERLY	5	8.2
OTHERS	6	9.8
YEARS OF SERVICE		
<3 YEARS	20	32.8
3-10 YEARS	34	55.8
>10 YEARS	7	11.5

The socio-demographic data reveals that many of the participants were between 21-30years (41%) with a mean age of 31.6years. There were more females (83.6%), majority are single (67.2%) with the majority of the participants having tertiary level of education (78.6). Majorities are Christians (86.9%) and nurses are the dominating professionals (65.6%). Many of the participants have been in service for 3-10 years (11.5%).

TABLE 2: KNOWLEDGE ON HEALTHCARE WASTE MANAGEMENT PRACTICES.

VARIABLE	FREQUENCY N=61	PERCENTAGE
Training On Waste Management		
NO	16	26.2
YES	45	73.8
Do You Know The Color Coding		

System For Waste Segregation		
NO	10	17.9
YES	44	72.1
Should Appropriate Gloves		
Be Worn When Handling Waste		
NO	3	4.9
YES	58	95.1
Should All Types Of Waste Be		
Collected In The Same Bin		
NO	40	65.6
YES	17	27.9
I DON'T KNOW	4	6.5

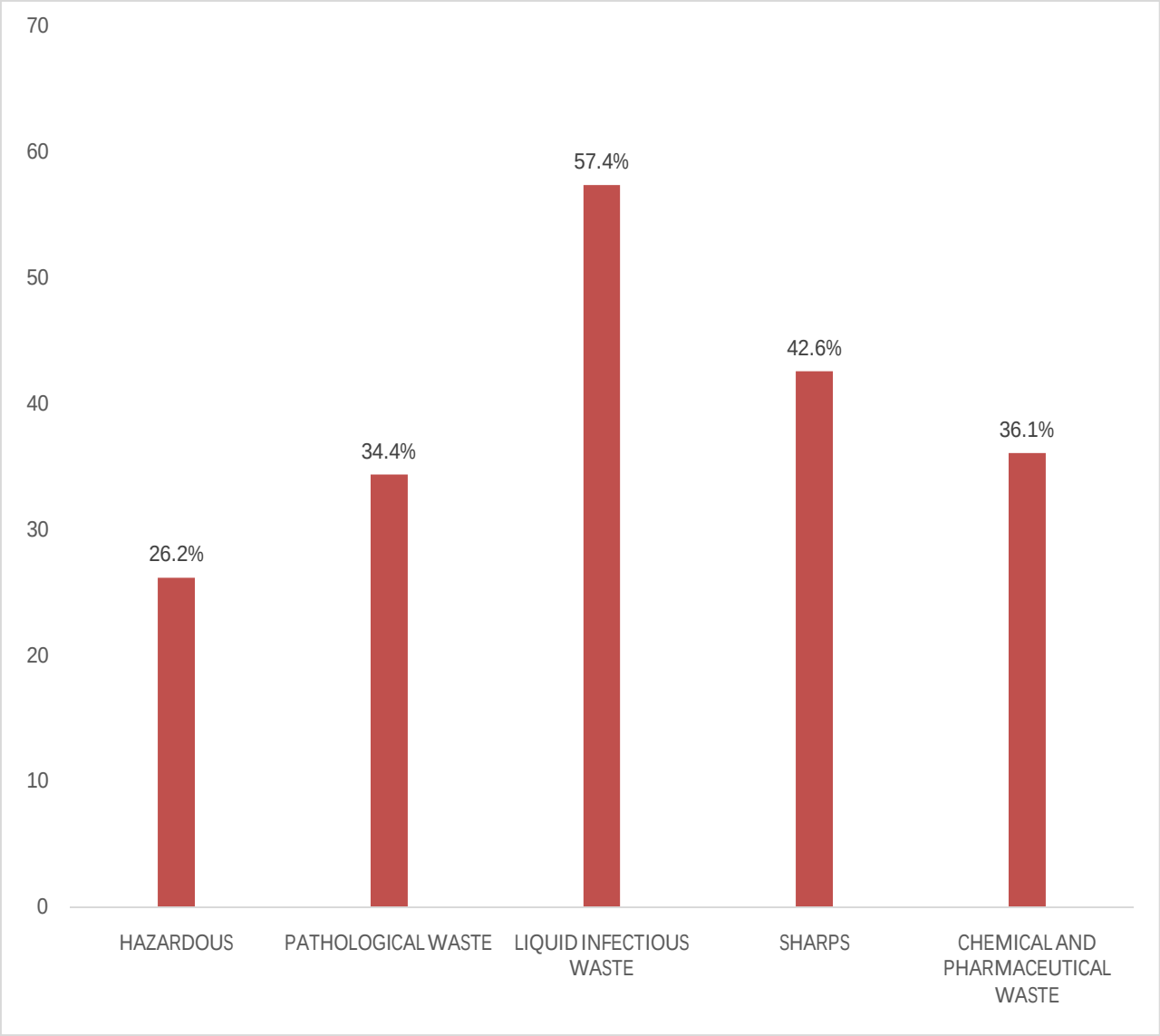

Fig 1: types of waste generated in the different facilities

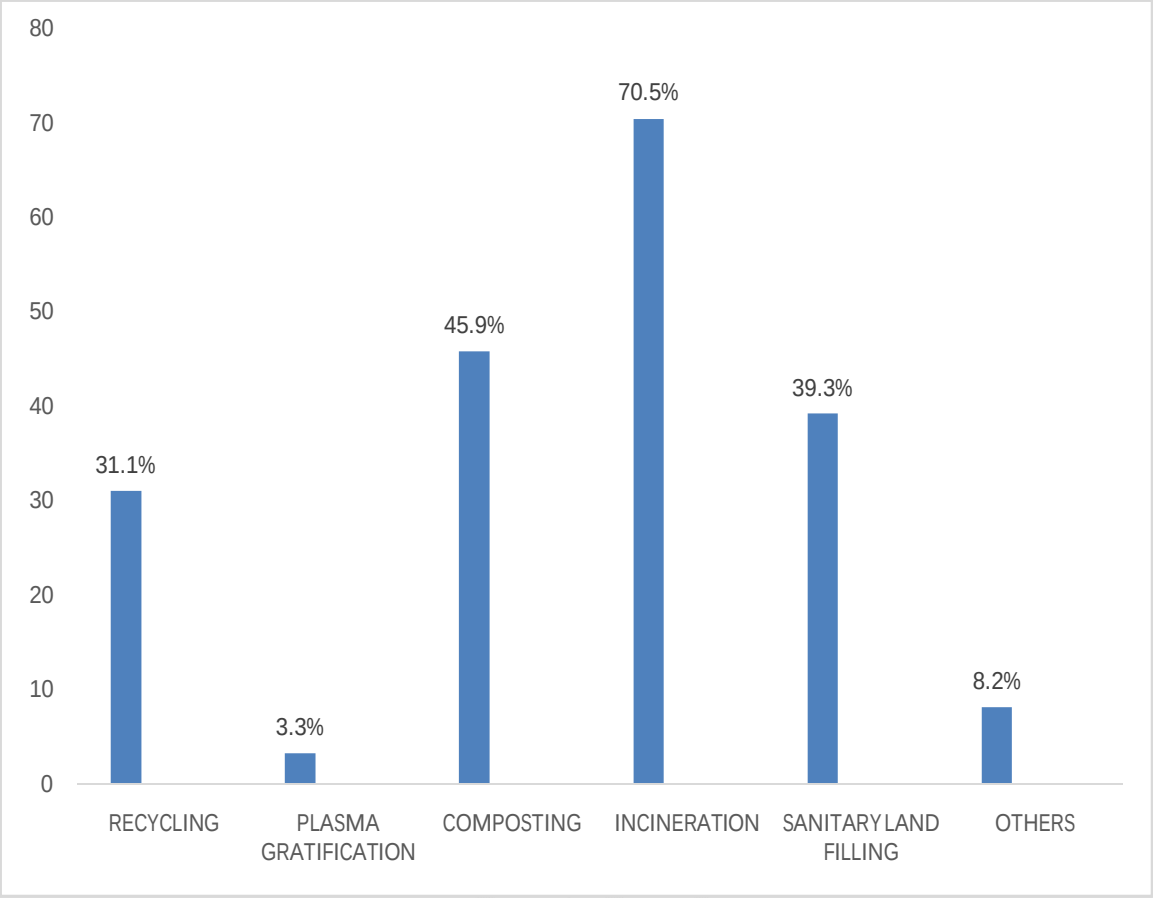

Fig 2: Method of sanitary disposal known

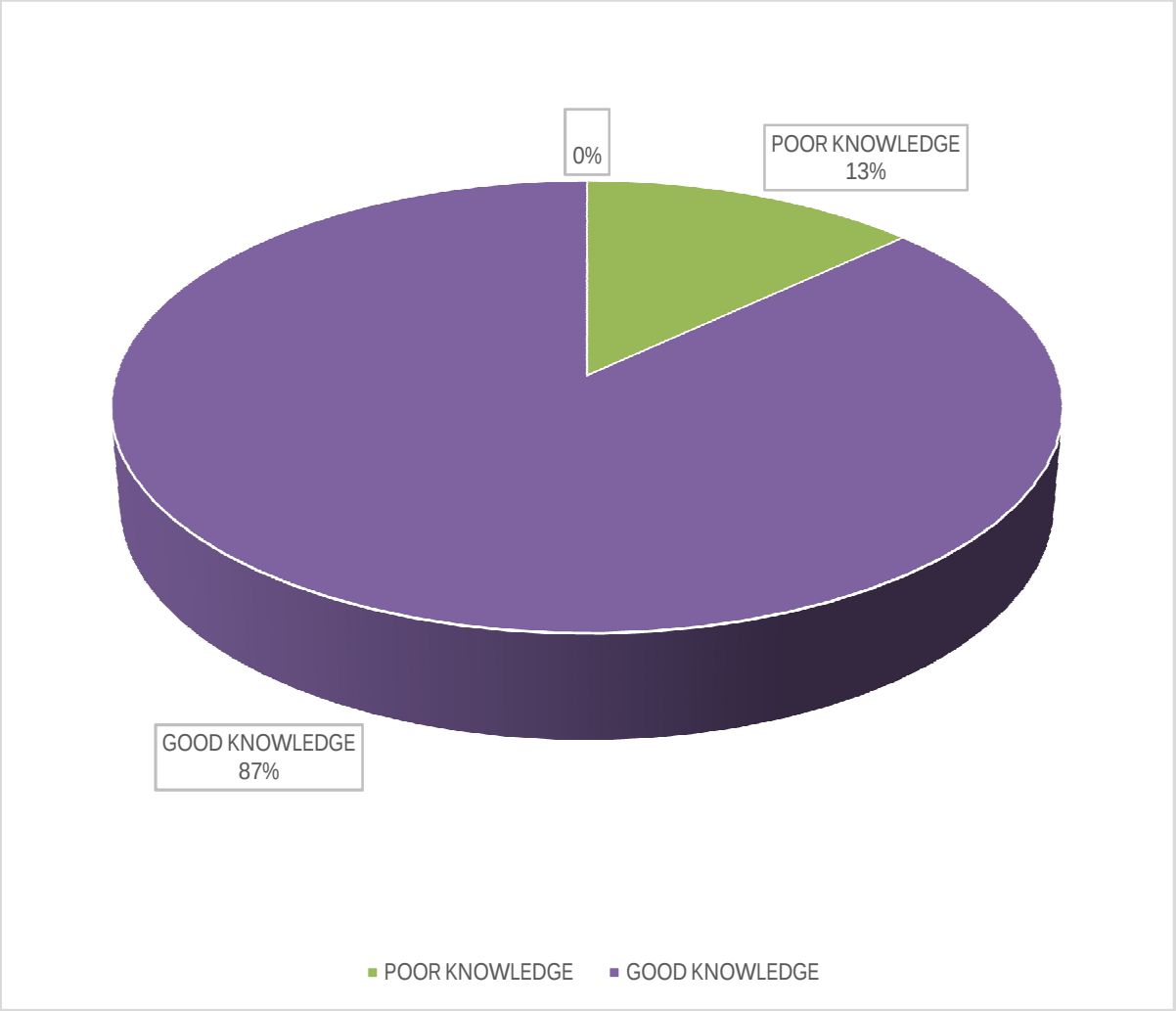

Fig 3: knowledge score

Majority of the participants had a good knowledge score. Using the composite variables in SPSS where a maximum score of 2 points was given to those with good responses and a minimum score of 1 was given to those with poor response.

Table 3: METHOD OF HEALTH CARE WASTE DISPOSAL

VARIABLE	FREQUENCY N=61	PERCENTAGE
Dispose Waste On Specified Containers		
NO	1	1.6
YES	50	82.0
SOMETIMES	10	16.4
I Dispose Sharps On Specified Puncture Proof Containers		
YES	55	90.2
SOMETIMES	6	9.8
Wear Gloves When Handling Waste		
YES	48	78.6
SOMETIMES	13	15.4

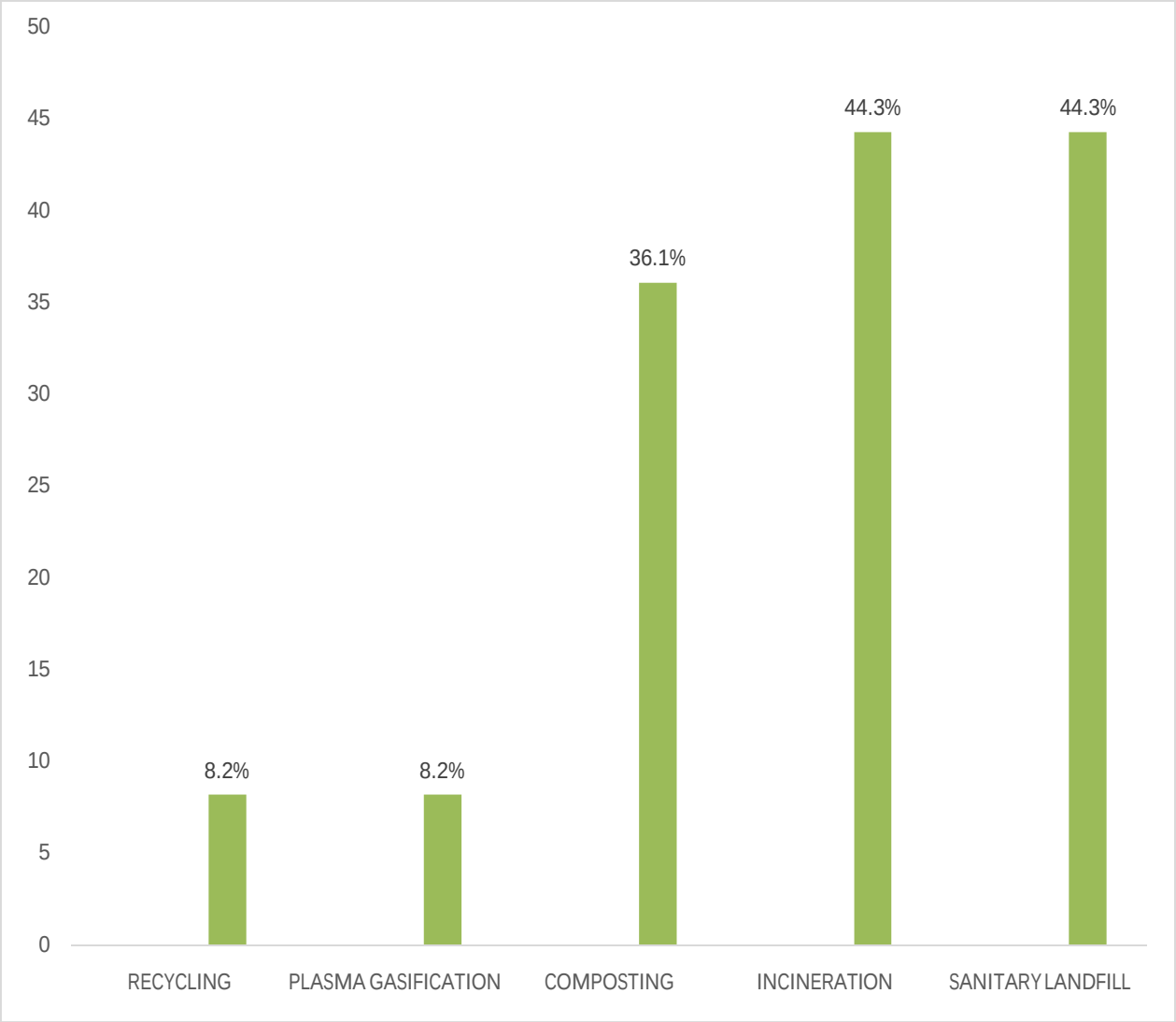

Fig 4: Method waste disposal used

Incineration and Sanitary landfill are the most common waste disposal method used.

TABLE 4: KNOWLEDGE ON RISK OF WASTE DISPOSAL

VARIABLE	FREQUENCY N=61	PERCENTAGE
Can Improperly Managed Waste Cause Infection		
YES	53	86.9
Can Improperly Disposed Waste Like Needle Cause Needle Injury		
YES	57	93.4
Poor Waste Disposal Practice Can Attract Microorganisms And Rodent		
NO	4	6.4
YES	57	93.4
Direct Dumping Of Untreated Waste Can Lead To Toxicity		
YES	57	93.4
I DON'T KNOW	4	6.5

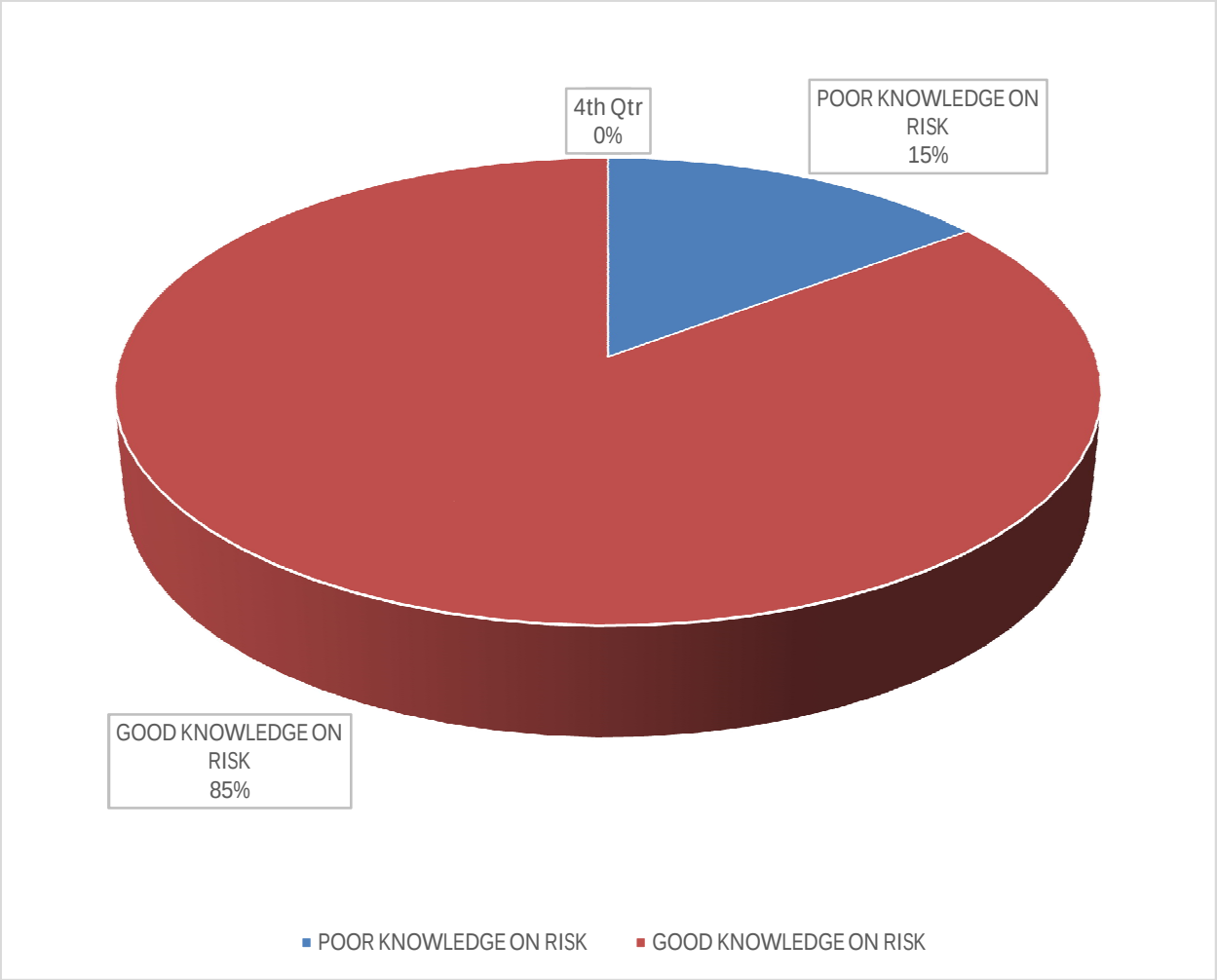

FIG 5: KNOWLEDGE SCORE ON RISK

There was good knowledge on the risk on poor waste disposal management.

TABLE 5: Association between selected socio-demographic data and knowledge of Health care waste management

SOCIO-DEMOGRAPHIC DATA	Variable				
	Knowledge		Total	$\chi 2$	P_{val}
	POOR	GOOD			
AGE GROUP					
11-20	-	4(6.6)	4(6.6)	0.68	0.88
21-30	2(3.3)	28(45.9)	20(32.8)		
31-40	-	12(19.7)	12(19.7)		
41-50	-	13(21.3)	13(21.3)		
51-60	-	4(6.6)	4(6.6)		
Total	2(3.3)	59(96.7)	61(100)		
DESIGNATION					
DOCTOR	-	4(6.6)	4(6.6)	0.92	0.97
NURSE	2(3.3)	42(68.9)	44(72.2)		
PHARMACIST	-	1(1.6)	1(1.6)		
LABORATORY TECHNICIAN	-	5(8.2)	5(8.2)		
ORDERLY	-	5(8.2)	5(8.2)		
OTHERS	-	4(6.6)	4(6.6)		
Total	2(3.3)	59(96.7)	61(100)		
LEVEL OF EDUCATION					
PRIMARY	-	5(8.2)	5(8.2)	0.68	0.88
SECONDARY	-	9(14.8)	9(14.8)		
TERTIARY	2	45(73.8)	49(80.3)		
Total	2(3.3)	59(96.7)	61(100)		

YEARS OF SERVICE					
<3 YEARS	-	21(34.4)	21(34.4)	1.44	0.69
3-10 YEARS	2	37(60.7)	39(63.9)		
>10 YEARS	-	15(24.6)	15(24.6)		
Total	2(3.3)	59(96.7)	61(100)		
SEX					
MALE	-	9(14.8)	9(14.8)	0.35	0.84
FEMALE	2(3.3)	50(81.9)	52(85.2)		
Total	2(3.3)	59(96.7)	61(100)		

There was no significant relationship between knowledge waste management disposal and social demographic data as level of significance was set at $p<0.05$.

TABLE 6: Association between knowledge of risk of poor waste management and knowledge of Health care waste management

Knowledge Risk of poor waste management	Variable				
	Knowledge		Total	$\chi 2$	P_{val}
	Poor	Good			
Poor knowledge Risk	-	4(6.6)	4(6.6)	0.21	0.65
Good Knowledge Risk	2(3.3)	55(90.2)	57(93.5)		
Total	2(3.3)	59(96.8)	61(100)		

There was no significant relationship between knowledge waste management disposal and knowledge on the risk of poor management as level of significance was set at $p<0.05$

5.0 DISCUSSION

The study focused on assessment of waste disposal practice in primary health facilities in Esan central Local Government Area of Edo State Nigeria. A total of 65 questionnaires were distributed for this study and 61 were retrieved given a response rate of 93.8%.

From the sociodemographic factors, nurses were the dominating health care professionals (65.6%) as compared to others, this was also similar to study done in Ethiopia [22] and Cairo [23] where nurses were more of the workforce in the primary health care sectors. Most of the participants were of the age group 21-50 years which revealed that the workforce were mainly middle aged as compared to Egypt where the major workforce was between the age of 35-44 years.

The study showed that majority of the participants (87%) had a good knowledge on health care waste management. This is similar to the studies done in Cameroon [24]and India [28] where good knowledge was said to be exhibited as in contrast with studies done in Egypt [22] and Ethiopia [23]. Incineration (70.5%) is identified as the main method of disposal of waste along with sanitary landfill as also observed in Ogun State Nigeria [21]. However, in Shanghai China [19] waste is removed from a muster point and recycled [19], and liquid waste is seen as the most generated (57.4%) in this study. On the other hand, biohazard waste was the main waste generated in China [19] while in Brazil, sharps were seen as the most generated waste [20].

Primary health centers (PHCs) are the basic structural and functional units of health care services in any given society [14]. Health care waste should be segregated according to the standardized procedures, which will reduce HCW (Health Care Workers) related threats to healthcare workers, disposal cost and the cost of treatment [15,16]. Proper management of HCW requires a

combination of proper waste handling during generation, collection, storage, transportation and treatment [17,18].

There was no level of significance between knowledge and sociodemographic factors in this study, but there was a level of significant level in a study done in Egypt where it was observed that mainly the house keepers of the hospital (orderly and cleaners) had a good knowledge of waste disposal as compared to those of other professions [23].

As regards knowledge of the risk of poor disposal method, it was seen that majority of the participants had good knowledge (85%) on the risk and negative impact this will have on people and the community at large. This was in contrast to a study in India that revealed that only 22% had correct knowledge on the risk of poor waste management disposal. Studies in South Africa [29] and Abakaliki [30] Nigeria were however similar to this study as participants exhibited good knowledge on the risk of poor waste management.

RECOMMENDATIONS

To further enhance health safety of workers, patients and general public, the following recommendations are made.

To the Government:

1. The government should make provision for adequate disposal of hospital waste by policy making and legislation.

2. Government should involve health care waste management officers that will ensure compliance.

3. The government should make financial provisions for the purchase of waste bins, Sharp box and sophisticated waste machine for the recycling of necessary waste materials were need be.

4. The government should ensure cooperation of both public and private health institutions to ensure management of health care waste.

5. Government should ensure training and retraining of health workers.

To the Health institutions

1. Health care Management board and teams should be set up to draw out policies and protocols for ensuring compliance to waste management.

2. Health institutions should organize programs on training on how to manage health care waste.

3. Health institutions should provide basic accessible waste disposal equipment and facilities

To the public

1. The public should ensure adherence to rules and regulations on waste disposal practices.

2. People should attend seminars on waste management disposal

3. The public should be cautious on precautionary measures to observe when around the hospital premises.

CONCLUSION

GENERAL PUBLIC HEALTH IMPLICATION OF THE STUDY

The public health implication of this study cannot be overemphasized as the prevention of diseases in the hospital and health care centers is of paramount importance to health workers and patients in order to promote good health and safety. Precautionary measures in the disposal of

wastes is a compulsory practice that should not be taken lightly. This is because environmentally sound management of HCW can prevent adverse health and environmental impacts from such waste including the unintended release of chemical or biological hazards like drug-resistant microorganisms, into the environment thus protecting the health of patients, health workers, and the community.

According to the World Health Organization [31], the disposal of untreated health care wastes in landfills can lead to the contamination of drinking, surface, and ground water if those landfills are not properly constructed.

Incineration of waste has been widely practiced, but inadequate incineration or the incineration of unsuitable materials results in the release of pollutants into the air and in the generation of ash residue. Incinerated materials containing or treated with chlorine can generate dioxins and furans, which are human carcinogens and have been associated with a range of adverse health effects. Incineration of heavy metals or materials with high metal content (in particular lead, mercury and cadmium) can lead to the spread of toxic metals in the environment [31].

Alternatives to incineration such as autoclaving, microwaving, steam treatment integrated with internal mixing, which minimize the formation and release of chemicals or hazardous emissions, should be given consideration in settings where there are sufficient resources to operate and maintain such systems and dispose of the treated waste [31].

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