

## **Attitude of Health Workers towards Hospital Waste Management in Jos Metropolis, Plateau State, Nigeria**

Toma Reng Ali<sup>1</sup> & Gimbason, Mairafi Daniel<sup>2</sup>

1. Plateau State College of Health Technology Zawan, Jos, Plateau State
2. Department of Community Medicine and PHCCHO Training Programme. Bingham University Teaching Hospital, Jos, Plateau State.

### **Abstract**

*Hospital wastes are identified as been responsible for the transmission of infectious diseases due to improper waste disposal and management. This study is therefore initiated to examine the attitude of health workers towards hospital waste management in Jos metropolis. Data was collected qualitatively and quantitatively using a survey questionnaire and in-depth interview (IDI) respectively. While seven (7) Key Informants were interviewed, although questionnaires were administered to 367 respondents, out of which 347 were retrieved and analyzed for the quantitative method. Finding of this study revealed that there were no colour coded wastes bin with biohazard symbols and covers in the health facilities as 64% of the respondents suggested that the State government and hospital management should make effort to provide colour coded waste bins that have covers with different biohazard symbols for various categories of wastes. It is recommended that the hospital authority and Plateau State government should make all effort to provide waste bins that have covers with different colour and biohazard symbols for various categories of wastes and ensure that health professionals are trained on waste disposal. This will go a long way to reduce the risk of contracting diseases and pollution in the hospital environment.*

**Keywords:** Waste Management, Healthcare Delivery, Health Professionals, Waste Collection, Disease Transmission

## **Introduction**

Waste is an inevitable aspect of human existence such that every human activity generates wastes, while some are harmful, others are not harmful to man and the environment. Ogbonna (2014) asserted that healthcare facilities also generate different types of infectious and hazardous waste, which poses an enormous risk to the patients, healthcare professionals, waste pickers and the community at large. Hence, healthcare waste management should be the major priority of every healthcare institution and government. Hospital wastes are identified as been responsible for the transmission of infectious diseases due to improper waste disposal and management. Hospital waste could be classified into hazardous (such as infectious, pharmaceuticals, sharps, chemical, radioactive and heavy metal) and non-hazardous (such as paper, packaging, debris). The World Health Organization (2003) defines healthcare waste as biomedical wastes which are infectious, contaminated and hazardous such as discarded sharps, non-sharps, blood, body parts, toxic chemicals, pharmaceuticals, medical devices and radioactive substances.

Alaku and Stephen (2017); the World Health Organization (2003); Patil and Pokhrel, (2005) maintained that despite the fact that health institutions are expected to provide preventive, promotive and curative care services, which may either be directly through patient care or indirectly by ensuring a clean and healthy environment for the health workers and the community. There is poor management of hospital waste, which in turn affects the wellbeing of the patients, the health workers but the nation at large. These poor outcomes are not only due to the high increase in the poverty level but also to the weakness in the health sector, especially in the delivery of primary healthcare services (FMOH, 2010).

In view of the enormous risk posed by hazardous wastes, the Basel Declaration to which Nigeria is a signatory, as adopted by the United Nations in 1999. Section (b) of the Declaration states that it remains the responsibility of healthcare establishments to treat and dispose wastes generated by them in such a manner as to ensure that there would be no adverse health or environmental effects. In the same vein, the World Health Organization (1999), set guidelines to address issues on improper hospital wastes management. The standard guideline and proper management of Healthcare waste is to minimize risks both within and outside healthcare facilities. The first global and comprehensive guidance document, *Safe Management of Wastes from Healthcare Activities*, originally released by WHO in 1999, addresses aspects such as regulatory framework, planning issues, waste minimization and recycling, handling, storage and transportation, treatment and disposal options, and training. The first priority is to segregate wastes, preferably at the point of generation, into reusable and non-reusable, hazardous and non-hazardous components. Generally, there are four key steps to healthcare waste management: Segregation into various components, including reusable and safe storage in appropriate containers; Transportation to waste treatment and disposal sites; Treatment; Final disposition (Nwachukwu and Ositadinma, 2003).

The sustainable management of healthcare waste has continued to generate increasing public interest due to the health problems associated with exposure of human beings to potentially hazardous waste arising from healthcare. Tudor (2015) opined that considerable gap exist with regards to the assessment of health care waste management practices particularly in Nigeria and in several other countries in sub-Saharan African. Hospital waste is any kind of waste containing infectious (or potentially infectious) materials. It may also include waste associated with the generation of biomedical waste that visually appears to be of medical or laboratory origin (e.g. packaging, unused bandages, infusion kits, etc.),

as well research laboratory waste containing biomolecules or organisms that are mainly restricted from environmental release.

A 1990 report by the United State Country Agency for Toxic Substances and Disease Registry concluded that the public is not likely to be adversely affected by biomedical waste generated in the traditional healthcare setting. They found, however, that biomedical waste from those settings may pose an injury and exposure risks via occupational contact with medical waste for doctors, nurses, and janitorial, laundry and refuse workers. Further, there are opportunities for the public to come into contact medical waste, such as needles used illicitly outside healthcare settings, or biomedical waste generated via home health care.

Studies had shown that between 75% and 80% of waste produced by health care providers is comparable to domestic waste. It comes mostly from administrative, kitchen and housekeeping functions of health care facilities and may include packaging waste and waste generated during maintenance of health care building. The remaining 20% of health care waste is regarded hazardous and may pose a variety of environment and health risk if not properly disposed (Fongwa, 2002). Waste is seldom segregated at the points of generation and compatibility and reliability issues abound when it comes to current treatment and disposal practices. Reflecting on this, there is potential for environmental exposure to toxic emissions from sub-standard incinerators (poor combustion conditions) and nuisance arising from foul stench, not leaving out attraction and proliferation of vermin. Even though there is some uncertainty around the degree of risks posed by clinical waste, there is rational agreement that, illegal and uncontrolled disposal threatens public health. For example, frequent outbreaks of typhoid, diarrhea and cholera in neighborhood communities can be associated with poor handling of such wastes (Fongwa, 2002).

Regardless of the reasons that necessitate generation of hospital waste and improper waste disposal, the consequences are often fatal. It often leads to poor health outcomes, transmission of infectious diseases, injuries and environmental hazards. It is amidst these concerns, that the need to carry out research in Jos metropolis in order to find out health professionals views on the impacts of hospital waste becomes imperative.

It is well established that the provision of timely information aimed at combating possible health menace among many other things (a healthy environment inclusive) is an important function of public health (Menizibeya, 2011). It is evident that since the last half of the twentieth century, the development in the medical sector around the world has lead to an increase in the use of disposable medical products, which has contributed, to the large amount of medical waste generated. These healthcare waste generated due to poor medical waste management causes environmental pollution, unpleasant smell, growth and multiplication of insects, rodents, worms and may also lead to transmission of disease like typhoid, cholera and hepatitis through injuries from sharps contaminated with blood cutting-wool and waste from the laboratory. It is no gainsaying that health facilities in Jos metropolis, Plateau state and the country's health institutions is faced with major problems associated with hospital wastes management and at the same time not measuring up to the international best practices. In the course of healthcare delivery, two major types of wastes are generated in the hospital. These are infectious (such as, sharps, disposable syringes, swabs, body fluids, human excreta etc.), and non-infectious wastes (such as papers, packaging, debris etc.). These wastes are to be segregated at the point of generation into different colour coded containers with specific biohazard symbols as specified by the international best practices according to WHO (1999).

Unfortunately the practice of wastes segregation by health facilities in Jos metropolis negates this specified practice as both infectious and non-infectious wastes are mixed up in a none colour coded container without biohazard symbols which left the health workers, patients and the public in danger of being infected or sustain injury in the course of wastes disposal. The attitude of health professionals in Jos metropolis towards wastes management is not satisfactory as only sharps (needle) are segregated into safety sharp boxes while other sharps are mixed up in the waste bins. This nonchalant and filthy attitude of health professionals makes the hospital environment unbearable for the sick patients and visitors and even the health professionals themselves as most wastes bins are filled to the brim and left uncovered which emit offensive odor thereby polluting the hospital environment.

The health workers and wastes collectors in Jos metropolis have suffered both wastes related diseases and occupational hazard in the course of healthcare delivery and disposal of wastes. Due to challenges that includes, inadequate safety measures that expose workers to the risk of being effected as most of the workers were not being provided with personal protective equipment while some are of the habits of not putting on this equipment in the course of healthcare delivery and wastes disposal. In the same vein, victims of environment related disease like malaria fever, typhoid fever, dysentery and others seem to be on the increase. It is a known fact that indiscriminate refuse dump affects quality of water and air of which the people seem not to be aware. Public Educational Programmes that enlighten the public on the implications of indiscriminate refuse dump are almost nonexistent. Mass media seem not to be doing enough to create awareness about the implications of indiscriminate refuse dump. It was against this background that the researcher intends to embark on this research in order to identify gaps in

current practices of hospital wastes management in Jos metropolis along with international best practices and recommend ways of bridging this gap.

### **The Concept of Healthcare Waste**

Health care waste (HCW) is defined as the total waste stream from a health care facility that includes both potential infectious waste and non-infectious waste materials. Infectious wastes include infectious sharps and infectious non-sharp materials. Infectious sharps are items that can cause direct injury such as syringe or other needles, blades, infusion sets, broken glass etc while infectious non-sharps include materials that have been in contact with human blood, or its derivatives, bandages, swabs or items soaked with blood, isolation wastes from highly infectious patients (including food residues), used and obsolete vaccine vials, bedding and other contaminated materials infected with human pathogens. Human excreta from patients are also included in this category (WHO, 2005). Non-infectious wastes may include materials that have not been in contact with patients such as paper and plastic packaging, metal, glass or other wastes, which are similar to household wastes. Hospital waste is defined as any solid and liquid waste that is generated in the diagnosis, treatment or immunization of human beings or animals, in related research, biological production or laboratory testing (Ferraz and Afonso, 2003). However, for better understanding of the subject matter, there is a need to define healthcare, healthcare waste and explain the nexus between healthcare waste and quality healthcare delivery.

Unsafe management of healthcare waste by health facilities has been a global phenomenon since the 17<sup>th</sup> century industrial revolution. Healthcare waste also termed biomedical waste contains infectious, contaminated and hazardous waste such as discarded sharps, non-sharps, blood, body parts, toxic chemicals, pharmaceuticals, medical devices and radioactive substances. If not managed

properly, it carries a substantial risk to the hospital staff, the patients, the community, public health and environment (Gibson and Gunmu, 2012; Ogbonna *et al.*, 2011).

The process of Healthcare Waste Management (HCWM) involves challenging issues like collection and segregation, timely removal and safe disposal, illegal scavenging, patient safety, occupational safety and environmental safety (Ananth 2010). Various steps in the process are mainly engineering functions, yet initial segregation and storage of healthcare waste are the responsibilities of health care workers (Patil, et al, 2005). During the recent past, effective and efficient stepwise HCWM has emerged as a critical component in control of healthcare associated infections (HAIs). In high-income countries, a combination of stringent application of legal provisions with other input has been effective in mitigating the menace of healthcare waste (Goddy et al, 2007). Furthermore, the World Health Organization (2009) identified health care waste to include all waste generated by health care establishments (that is, hospitals, research facilities, and laboratories) and further categorized healthcare waste into infectious (waste that can transmit diseases) and non-infectious (wastes that cannot transmit diseases) wastes. Ogbonna, (2014) stated that hazardous wastes, which come in the form of chemical, radioactive, pathological and anatomical wastes amongst others.

Today's understanding about health is total well-being and not only to be a matter of the absence of disease (Raebun and Rootman, 1998). As observed by Amatayakul (2004), many changes in healthcare structure continuously shape the industry, creating and improving job functions of health workers. In addition, factors such as technological advances, the aging population, complementary therapies, and increasing costs while having an impact on growth of the healthcare industry, stating that technological advances are improving patient care

and aiding diagnostic, therapeutic, and ancillary processes. Physicians and other clinical personnel are also able to make precise and better-informed decisions due to conducive hospital environment. However, biomedical waste is generated from biological and medical sources and activities, such as the diagnosis, prevention, or treatment of diseases. Common generators (or producers) of biomedical waste include hospitals, health clinics, nursing homes, emergency medical services, medical research laboratories, offices of physicians, dentists, and veterinarians, home health care, and morgues or funeral homes. In healthcare, facilities affect quality of care delivery as both the patients and health professionals are exposed to infectious disease emanating from the wastes.

Abah and Ohimain (2011) reported that, there may not be much of a difference in the way and manner wastes generated in various health care institutions are managed in Nigeria. A good example is given by the findings of the study in Lagos by Olubukola (2015) which reported the similarity in waste data and HCW management practices in two general hospitals. Characterized by a lack of waste minimization or waste reduction strategies, poor waste segregation practices, lack of instructive posters on waste segregation and disposal of HCW with general waste. The mismanagement of healthcare waste poses health risks to people and the environment by contaminating the air, soil and water resources. Hospitals and healthcare units are supposed to safeguard the health of the community. However, healthcare wastes if not properly managed can pose an even greater threat than the original diseases themselves (Path, 2009).

A study of Health Care Waste management in Jos Metropolis, Nigeria has demonstrated that the waste management options in the hospitals did not meet the standard practices (Ngwuluka, 2017). Waste management with safe and environmentally sound methods cannot be over-emphasized. The hospital

management board and the hospitals should make a conscious and deliberate effort to ensure they do not contribute to the present and future threats to human health and the environment by poor waste management practices. In order to execute standard waste management, an understudy of a healthcare establishment with standard waste management practices in or outside the country may be the first practical step to undertake (Ngwuluka, 2009). In another study in Port-Harcourt metropolis, Nigeria by Ogbonna, (2011) assesses hospitals waste management practice. The study revealed that hospital waste management issues and problems are not peculiar to Port Harcourt metropolis alone. Solid waste disposal methods indicated that open dumpsites is most preferred while incineration was nonexistent in the hospitals, clinics. Most other hospitals do not segregate wastes into marked or colour coded containers for the different waste streams neither do they keep records of waste generation and disposal. In addition, the study revealed that both hospital waste generators and handlers treat hospital wastes as a usual domestic waste.

### **Research Methodology**

Data were collected using both quantitative and qualitative methods, as the study seeks to examine the opinion of different groups of health workers. The qualitative data for this study were collected using a structured questionnaire, which was administered to healthcare professionals through face-to-face distribution. Some questionnaires were administered indirectly through the unit heads in the selected health institutions. The answered questionnaires were returned to the researcher through hand-to-hand collection with the assistance of the department/unit heads. The questionnaire contains both open-ended and close-ended questions on the Attitude of Health Workers towards Hospital Waste Management in Jos Metropolis.

**Population of Study:** The study population comprises of patients and all health workers; doctors, nurses, medical laboratory scientists, pharmacists, health record officers, radiologists, physiotherapists, ICT workers and medical social workers in the Jos University Teaching Hospital, Bingham University Teaching Hospital and Plateau Specialist Hospital.

**Sampling:** Data were obtained using probability and non-probability sampling techniques. For probability sampling technique, the stratified random sampling method was used, while the non-probability sampling technique was available and purposive sampling. Stratified sampling is a form of random sampling in which the population is divided into two or more groups/strata according to one or more common attributes. This method was considered more appropriate because it gives every member of the population an equal chance of being selected and opinion of different groups of health workers was required for the study.

Jos University Teaching Hospital has 2094 workers, Plateau Specialist Hospital has 620 workers and Bingham University Teaching Hospital has 348 workers (Field Survey, 2019).

The Yamane (1967) formula is used to determine the sample size of this study.

$$n = \frac{N}{1 + N(e^2)}$$

Based on the formula, the proportionate percentage of the study is 12%. Hence, the formula was used to determine the sample size of each group of health professionals in JUTH, Plateau Specialists Hospital and BUTH.

## **Methods of Data Collection**

Population of Healthcare Professionals in JUTH, Plateau Specialist Hospital and BUTH as at November 2019, are as follows: Jos University Teaching Hospital, 2094, sample 251; Plateau Specialists Hospital, 620, sample 74; and 348 in Bingham University Teaching Hospital, sample 42. A total of 367 sample from 3062 populations.

Systematic sampling technique, which is a probability sampling method, was further adopted to select respondents for the study. This technique was considered more appropriate in selecting the respondents because the hospital system and the nature of the job of the respondents, which include shifting, call duty, posting, and some professionals attending to patients or in the surgical room, thus it makes the final selection of doctors and nurses difficult in the hospital. Nevertheless, since these groups of health professionals constitute a significant number of the study population that will give adequate information for the study. Hence, the questionnaires were administered in the morning to those who were in the morning shift by 8am and in the afternoon to those who were in the afternoon shift by 3pm. The first professional that resumes office was sampled, the second professional was skipped, while the third professional was sampled. Thus, the interval of one professional was observed before the next was selected, this was done until the sample size was completed.

For the qualitative method (in-depth interview), purposive sampling technique was adopted to elicit information from ten key informant. These key informants however included head of departments or health workers assigned by the head of department (who were doctors, nurses, health record workers, medical laboratory scientists, physiotherapists, radiologists, wastes workers and pharmacist from JUTH, Plateau Hospital, BUTH).

## **Methods of Data Analysis**

Data collected from the field through a survey questionnaire went through the process of data cleaning in order to minimize errors, coding was done. Inspection of the coded data was done to ensure coding accuracy after which the data was analyzed using statistical packages for social sciences (SPSS) version 21. Findings were presented in tables, frequencies and percentages.

For the qualitative components of the study, data from the in-depth interview and observation were presented in narrative form after it was transcribed from a tape recorder and camera to a written format. Furthermore, data from the qualitative method was synergized with data obtain from the quantitative method in the area where necessary, with the aim of identifying the point of convergence or divergence of the two methods.

## **Ethical Consideration**

Approval for carrying out the research was obtained from the Plateau State Ministry of Health. All participants were provided with clear information and asked if they would be willing to participate or not. Only those who were willing to participate were involved and written consent was obtained. All information obtained for the study was treated with utmost confidentiality and the names of the respondents were not required in order to ensure anonymity.

## **Findings**

Although questionnaires were administered to 367 respondents, out of which 347 were retrieved. Four health professionals were interviewed in JUTH, three were interviewed in Plateau Specialists Hospital and two were interviewed in BUTH hospital. The quantitative data generated through questionnaire were processed and analyzed using the Statistical Package for Social Sciences (SPSS) Version 21. The qualitative data elicited from in-depth interview were transcribed verbatim

and interpreted. Therefore, the analysis and interpretation of the findings were from the quantitative and qualitative sources (see table 1).

**Table 1: Socio-demographic Characteristics of Respondents**

S/N	Variables	Male (%)	Female (%)	Total (%)
1	<b>Age in Years</b>			
	Below 25	26 (7.5%)	12 (3.5%)	38 (11%)
	26 – 35	32 (9.2%)	68 (19.6%)	100 (28.8%)
	36 – 45	28 (8.1%)	29 (8.3%)	57 (16.4%)
	46 and above	72 (20.7%)	80 (23.1%)	152 (43.8%)
2	<b>Marital Status</b>			
	Married	102 (29.4%)	146 (42.1%)	248 (71.5%)
	Single	57 (16.4%)	30 (8.7%)	87 (25.1%)
	Widowed	0 (0%)	5 (1.4%)	5 (1.4%)
	Divorced	3 (0.9%)	4 (1.2%)	7 (2.0%)
3	<b>Religion</b>			
	Christianity	89 (25.6%)	121 (34.9%)	210 (60.5%)
	Islam	74 (21.3%)	60 (17.3%)	134 (38.6%)
	Traditional	1 (0.3%)	2 (0.6%)	3 (0.9%)
4	<b>Level of Education</b>			
	Primary	0 (0%)	1 (0.3%)	1 (0.3%)
	Secondary	15 (4.3%)	3 (0.9%)	18 (5.2%)
	Tertiary	143 (41.2%)	185 (53.3%)	328 (94.5%)
5	<b>Profession</b>			
	Doctor	55 (15.8%)	30 (8.7%)	85 (24.5%)
	Nurse	40 (11.5%)	121 (34.9%)	157 (46.4%)
	Pharmacist	4 (1.2%)	5 (1.4%)	9 (2.6%)
	Medical Lab Scientist	15 (4.3%)	9 (2.6%)	24 (6.9%)
	Healthcare Attendant	1 (0.3%)	9 (2.6%)	10 (2.9%)
	Waste Collector	13 (3.7%)	0 (0%)	13 (3.7%)
	Comm. Health Workers	20 (5.8%)	8 (2.3%)	28 (8.1%)
	Health Record Officers	10 (2.9%)	7 (2.0%)	17 (4.9%)

Sources: Toma & Gimbason (2019).

Out of the 347 respondents, females constituted the majority with 189 (54.5%) as against 158 (45.5%) males. This implies that females were more willing to

participate in the study than their male counterparts, couple with the fact that majority of the nursing staff are females may also explain the higher representation of females in the study.

The age of the respondents shows that majority 152 (43.8%) are forty-six years and above, followed by 100 (28.8%) which are within the age brackets 26 and 35 years and 57 (16.4%) which are within the age bracket 36 and 45 years, while 38 (11%) are within the age bracket twenty-five years and below. The age distribution reveals that the matured health professionals constituted the majority of the respondents in Jos metropolis.

The marital status of the respondents shows that majority 248 (71.5%) are married, while 87 (25.1%) constituted the singles, the widowed and the divorced are few in number in the health facilities. On educational background, it shows that a significant proportion 328 (94.5%) of the respondents are tertiary school graduates. On profession, it shows that 157 (46.4%) of the respondents are nurses, followed by the doctors which constitute 85 (24.5%).

On distribution by health facility shows that the majority 210 (68.9%) of the respondents are from Jos University Teaching Hospital (JUTH), followed by 87 (19.6%) respondents are from Plateau Specialist Hospital (PSH) and 40 (11.5%) of the respondents are from Bingham University Teaching Hospital (BUTH). This can be attributed to the fact that the federal government manages Jos University Teaching Hospital. Hence, there is more work force than Plateau Specialist Hospital, which is managed by Plateau State government, and Bingham University Teaching Hospital, which is a privately owned health facility.

A significant number of respondents (97.7%) were knowledgeable of the health implications of hospital waste. The respondents also identified the kinds of waste generated by their various health facilities as infectious and non-infectious waste respectively. The study found that majority 253 (72.9%) of the respondents identified all of the various wastes generated by their health facilities, which include plastic bags/containers, used papers, syringes, used X-ray films, bottles, expired drugs, placenta, and pathological, only 19 (5.5%) of the respondents identified plastic bags/containers. More female respondents seem to have more knowledge on types of wastes generated because nurses who are mostly females constitute the large number of selected health workers. All the Key Informants, supported this view during in-depth interview with a Female Chief Nursing Officer in JUTH gave a general description of how these wastes are categorized thus:

Two major types of waste are generated in this hospital. We have the general wastes and the medical wastes. The medical wastes are further divided into two: the solid waste and liquid waste. All the liquid waste is channeled to the sewage disposal site, which is located far away from the hospital premises.

The finding above confirms that the respondents had knowledge on various types of wastes generated in the health facilities, which the categorized as infectious and non-infectious waste respectively.

From Table 2 shows that 162 (46.7%) of the respondents indicated that wastes are mostly generated from all sections of the health facilities, while 94 (27.1%) respondents indicated that most of the waste are generated in wards and theaters. The implication of this finding is that all departments, wards and units generate waste in the health facilities.

**Table 2: Generation of Hazardous Wastes by Health Departments**

S/N	Health Departments	Male (%)	Female (%)	Total (%)
1	Wards/theatres	50 (14.4%)	44 (12.7%)	94 (27.1%)
2	Accident and emergency	13 (3.7%)	10 (2.9%)	23 (6.6%)
3	Laboratories	33 (9.5%)	27 (7.8%)	60 (17.3%)
4	All Sections	59 (17.0%)	103 (29.7%)	162 (46.7%)
5	No Response	3 (0.9%)	5 (1.4%)	8 (2.3%)

**Sources:** Toma & Gimbason (2019).

Further investigation in this study reveals that 222 (64%) of the respondents affirmed that knew that health wastes were segregated into different types. Only 102 (29.4%) said no, but 23 (6.6%) said they did not know. In an interview with a male Community Health Officer in BUTH, he stated that:

Health wastes are supposed to be segregated, there are even posters everywhere in the hospital indicating the various categories of wastes and how they can be disposed. But unfortunately health professionals do not observe such precautions

Finding of this study reveals that 87% of the respondents agreed that wastes generated by health facilities in Jos metropolis is harmful to the workers, patients and as well as the public. The research participants further identified some of the effects of wastes to include; transmission of disease, environmental pollution and poor healthcare delivery. Probing further, majority 188 (54.2%) of the respondents who are mostly, females indicated that diseases/infections was a

major effect of wastes on health workers, patients and the residence of Jos metropolis. Further investigation revealed that the respondents admitted that needle piercing was the most common occupational hazard they experienced. The health implication of such piercing cannot be overlooked especially in view of the incidence of Hepatitis and HIV/AIDS.

Table 3 indicates that 306 (88.2%) of the respondents indicated that hospital waste transmit diseases such staphylococcus aureus, klebsiella pneumonia, Escherichia coli, proteus mirabilis, tetanus, typhoid, cholera and many other diseases. In the same vein, 290 (83.6%) of the respondents indicated that hospital waste affects the public and health professionals in the health institutions as it leads to environmental pollution. 197 (56.6%) respondents indicated that the wastes generated by the health facilities lead to poor healthcare delivery in Jos metropolis.

**Table 3 Regularity of Effects of Hospital Wastes on Health Professionals and the Public in Jos Metropolis**

Response	Frequent	Not frequent	Not at all	No response	Total
Transmission of disease	306(88.2%)	31(8.9%)	0	10(2.9%)	347(100%)
Environmental Pollution	290(83.6%)	52(15%)	4(1.2%)	1(0.3%)	347(100%)
Poor Healthcare Delivery	197(56.8%)	91(26.2%)	59(17%)	0	347(100%)
Air borne disease	27(7.8%)	28(8.1%)	292(84.2%)	0	347(100%)
Others	251(72.3%)	50(14.4%)	37(10.6%)	9(2.6%)	347(100%)

Sources: Toma & Gimbason (2019).

Findings further shows that 154 (44.4%) of the respondents identified the Public Health Unit as responsible for the healthcare waste management while few 72 (20.7%) of the respondents said it is the responsibility of all the staff to manage waste, while 63 (18.2%) indicated that the hospital management is responsible for waste management. However if health professionals and the public are conscious of wastes and the implication waste pose to the health of people, then it behooves that all hands be on deck to ensure no one is unnecessarily exposed to the dangers of improperly disposed wastes.

During an interview with Waste Collectors in JUTH and Plateau Specialist Hospital, it was discovered that hired hands outside the Public Health Unit are also help in wastes management. According to one of the male waste collector stated that:

Yes, there are outside parties aside from the hospital public health department. They are the one that use to packing it from the wards to the big plastic dustbin. These companies help to clean the environment, wards and offices; they are not the one in charge of the hospital waste disposal. It is our men from Public Health Unit that will pack the wastes to a junction where they will finally carry them to the final disposal.

Waste treatment practices obtainable in the hospital; autoclave, incineration, chemical disinfection, waste burial and encapsulation of waste, the treatment of sewage were observed and found to be effective. However, it was observed that both landfill and incineration which were supposed to be the major wastes treatment in Jos metropolis were not functioning as they should. The incinerator at the time of study was not functioning and the vehicles could not get to the trench where the wastes are supposed to be deposited thus, resulting in wastes being dumped in the open at the entrance of the trench, where all these sorts of

wastes are burnt. This is in line with the scenario reported by Taghipour *et al.* (2009) who making reference to Iran, said that medical wastes are still handled and disposed-off together with domestic wastes in most cities with a poorly designed landfill and incinerator for the treatment of wastes which pose operational and maintenance problems.

To understand workers' perception on their level of satisfaction with waste management in Jos metropolis, the findings revealed that very few people are very satisfied with waste management as indicated by 45 (16%). The majority 138 (47%) of the workers indicated they were only somewhat satisfactory while 96 (33%) were not impressed. Goal attainment as the second functional schemes explains this objective. The primary goal of the hospital is to take care of patients. In addition, for the hospital to function and attain this goal, the hospital management board must meet the needs of the hospital workers in general in terms of salary, security, social welfare and healthcare scheme among others. This is to motivate all the workers in various units/departments to play their different roles, thereby leading to the hospital goal attainment of healthcare services. In a situation where one of the motivating factors is lacking, there is bound to be dysfunction in the subsystem (health) and in the entire system (society) thereby defeating the hospital primary goal.

## **Conclusion**

The findings of this study demonstrated that the waste management practice in Jos metropolis did not meet international best practices. Waste management with safe and environmentally sound methods cannot be over-emphasized. Hence, the hospital management board and the hospital workers need to imbibe the culture of good and proper waste management practice that will prevent staff, patients and the public from the attendant threats of poor waste management practices.

In order to execute standard waste management, the government and the hospital management should put more effort to provide the hospital workers with enough personal protective equipment, workers should report any accident of occupational hazard to the appropriate authority and positive attitudes towards proper segregation of all wastes into different waste categories should be imbibe. There should be intensive training and retraining of workers and waste handlers on effective waste management activities. Furthermore, the required waste management facilities such as the right containers, incinerators, landfills, waste disposal vehicles and a recycling plant as well as the technologies such as irradiation, encapsulation and chemical disinfection should be installed. However, in order to reduce the cost of waste management, the hospital can collaborate to have central facilities and make appropriate budget that will cover all waste management cost in the hospital.

### **Contributions to Knowledge**

This study established that there is a direct relationship between hospital waste management and quality healthcare delivery. Hence, availability of waste management facilities in the hospital alone cannot enhance a conducive environment. Rather, there should be intensive training and retraining of workers and waste handlers on effective waste management activities.

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Address Correspondence to:  
*Gimbason, Mairafi Daniel*  
*Department of Community Medicine*  
*and PHCCHO Training Programme.*  
*Bingham University Teaching Hospital,*  
*Jos, Plateau State, Nigeria*  
[dgimbason@yahoo.com](mailto:dgimbason@yahoo.com)