Assessment of Medical Waste Management Practices in Selected Hospital (A Case Study of Owo, Ondo State)

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ABSTRACT

The study examined assessment of medical waste management practices in selected hospital and adopted descriptive crosssectional design utilizing quantitative method of data collection. Simple random sampling was used to select 244 health care personnel comprising of doctors, nurses and support staff all from the casualty, orthopedic and the general surgery departments. Structured questionnaires were administered to them for quantitative data. Quantitative data were analyzed using the quantitative program for social and market research (QPSMR) and chi squares and the level of significance was set at P ≤0.05. Descriptive statistics were carried out to determine relative frequencies, percentages and means of variables. The results showed that most of the healthcare personnel were aware of the medical waste management practices in the hospital and the practices were satisfactory. However, awareness of medical waste management practices in this institution can still be improved, especially in the segregation aspect since only 44% of the study population was aware of the correct segregation practices. Education was seen to have a significance influence on medical waste management with mean chi square results $X^2(2, N=244) = 7.4408$, $P = 0.03165 (p<0.05)$. The mean chi square results $X^2(1, N=244) = 9.5386$, $P = 0.013$ indicated a significant relationship between training and awareness on correct practices as the mean $P < 0.05$.It is therefore recommended that there is need to have a constant supply of the equipment and more importantly the segregation bags. Moreover, there is need to train the healthcare personnel especially the doctors as they seemed to be less aware of medical waste management.

INTRODUCTION

Background of the Study

The WHO classifies medical or healthcare waste into communal waste or general waste and special waste. Communal or general waste is all solid waste not including infectious, chemical, or radioactive waste. This waste stream can include items such as packaging materials, bedding waste water from laundries, office supplies and other substances that do not pose a special handling problem or hazard to human health or the environment (WHO, 1999) . These wastes consist of several different subcategories:

Infection wastes

Infectious waste contains pathogens (bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. This category includes cultures and stock of infectious agents from laboratory work, waste from surgery and autopsies on patients with infectious diseases, waste from infected patients in isolation wards, waste that has been in contact with infected patients undergoing hem dialysis (e.g. Dialysis equipment such as tubing and filters, disposable towels, gowns and aprons, gloves and laboratory coats) and waste that has been in contact with animals inoculated with an infectious agent or suffering from an infectious disease.(WHO,1999)

Pathological wastes

Pathological wastes consist of tissues, organs, body parts, human fetuses and animal carcasses, most blood and body fluids. Within this category, recognizable human or animal body parts are also called anatomical waste. Anatomical waste is also considered as an infectious waste, even though it may also include healthy body parts. (WHO, 1999)

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Sharps

Sharps are items that could cause cuts or puncture wounds, including needles, syringes, scalpels, saws, blades, broken glass and nails. Whether or not they are infected, such items are usually considered as highly hazardous healthcare waste (WHO, 1999)

Pharmaceutical wastes

Pharmaceutical wastes include pharmaceutical products, drugs, and chemicals that have been returned from wards, have been spilled, are outdated or contaminated, or are to be discarded because they are no longer required. These also include discarded items used in the handling of pharmaceuticals, such as bottles or boxes with residues, gloves, masks, connecting tubing, and drug vials. (WHO, 1999)

Genotoxic wastes

Genotoxic waste is highly hazardous and may have mutagenic, teratogenic, or carcinogenic properties. It raises serious safety problems, both inside hospitals and after disposal, and should be given special attention. Genotoxic waste may include certain cytostatic drugs, vomit, urine, or faeces from patients treated with cytostatic drugs, chemicals, and radioactive material. Cytotoxic (or antineoplastic) drugs, the principal substances in this category, have the ability to kill or stop the growth of certain living cells and are used in chemotherapy of cancer. They play an important role in the therapy of various neoplastic conditions but are also finding wider application as immunosuppressive agents in organ transplantation and in treating various diseases with an immunological basis. Cytotoxic drugs are most often used in specialized departments such as oncology and radiotherapy units, whose main role is cancer treatment; however, their use in other hospital departments is increasing and they may also be used outside the hospital setting (WHO, 1999)

Hazardous wastes

Healthcare waste includes discarded solid, liquid, and gaseous chemicals from various hospital activities. This waste can be hazardous or nonhazardous. Hazardous waste poses risks if it is toxic, corrosive, flammable, reactive, or genotoxic. Nonhazardous waste lacks these dangerous properties. Hazardous waste with high heavy-metal content, such as mercury from broken medical equipment and cadmium from discarded batteries, is particularly toxic. Pressurized containers, like gas cylinders and aerosol cans, must be properly disposed of after use. Radioactive waste, contaminated with radionuclides, is generated from medical imaging and therapeutic procedures.The impact of these wastes on the general population can occur through chronic exposure (long-term contact with small amounts in water, food, or air) or acute exposure (short-term contact with large amounts, often through occupational exposure). Proper management is essential to protect public health and prevent exposure to these hazardous materials WHO 1999)

Hospitals are health institutions providing patient care services. It is the duty of hospital and healthcare centers to take care of public health. This may directly be through patient care or indirectly by ensuring a clean, healthy environment for their employees and the community (Patil*et al.*, 2005). In the process of healthcare delivery, waste is generated which includes sharps, human tissues or body parts and other infectious materials (Bavej*aet al.*, 2000) also referred to as "Medical Waste" or"Hospital Solid Waste". Medical wastes are defined to include all types of wastes produced by health facilities such as general hospitals, medical centers and dispensaries. Medical wastes represent a small amount of total residues generated in a community. However, such residues can potentially transmit diseases and present an additional risk to the staff of the healthcare facilities, patients and the community when the wastes are not managed properly (Silva *et al.*, 2005).

Statement of the Problem

Medical waste management is still a major problem mostly in developing countries. Previous studies done have shown that first world countries have developed a system of waste disposal that is able to ensure proper sorting at the source and disposing them. But in Africa these facilities are lacking and therefore all types of wastes are mixed up together along the whole disposal chain from collection to transportation to disposal.

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(WHO, 1999) In addition, there is also an element of poor infrastructure and lack of risk awareness among the medical personnel and the sanitary staff. Nigeria like many developing countries experience the problem of getting sufficient medical supply and even worse is the disposal of medical waste. This is due to lack enforcement of legislation for handling, treatment and disposal. Furthermore, there is less consideration of the risks involved while handling medical wastes, largely by all those involved, including the government, healthcare personnel and the general public. (MOH, 2006) Taking into account that FMC is a referral hospital with a capacity of more than 1800 beds, it produces the greatest amount of waste in Nigeria and hence there is a need for proper medical waste management practices so as to minimize the risks involved.

Research questions

1. What is the level of awareness on medical waste management practices among the health care personnel in FMC, Owo?
2. What are the current practices on medical waste management at FMC, Owo?
3. What are the factors associated with proper medical waste management?

Objective of the study

To assess the awareness and practice on medical waste management among health care personnel in FMC, Owo:

1. To assess the awareness on medical waste management among the health care personnel in FMC, Owo.
2. To assess the current practices on medical waste management at FMC, Owo.
3. To assess the factors associated with correct medical waste management.

Significance of the study

In many countries, hazardous and medical wastes are still handled and disposed together with municipal wastes, posing a great health risk to municipal workers, the public and the environment. MW must be separated from municipal waste, but in many parts of Africa it tends to be collected along with the rest of the waste stream (Kgathi*et al.*, 2001; Taru*et al.*, 2005).

Nurses and other health care personnel must also be educated on the risks in order to improve their practices with regard to MEDICAL WASTE MANAGEMENT PRACTICES. Since today's nurses and doctors are required to carry out expanded roles in a variety of settings, they have to be ecologically sensitive in assessing the impact of their practices to the environment and how to provide ways to reduce the hazards.(Sristhi,2000) FMC was selected because it is the largest hospital in Owo town. The study will create public awareness regarding the health risk of the medical waste; they will also make relevant recommendations to hospitals and medical centers on possible ways of determining managing Medical waste. The document also contributes to the already existing body of academic knowledge, in that it serves as a source of information for subsequent research in this area.

Scope of the study

There are many hospitals in Owo, Ondo State and its environs, this includes government and privately-owned, this study is limited to Federal Medical Centre, Owo, Ondo State, and this becomes necessary due to financial constraint and time to gather the required data for the study.

LITERATURE REVIEW

Medical waste management

Medical waste management is essential for maintaining hygiene in healthcare institutions and protecting both healthcare workers and communities (Sanitation Connection, 2002). The management process typically involves segregation, safe storage, transportation to treatment and disposal sites, and final disposal

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(Johannessen et al., 2000). Acharya et al. (2000) also highlight crucial steps like handling, mutilation, disinfection, and storage. Effective segregation and identification are critical, with color-coded plastic bags or containers recommended for waste categorization (Rao et al., 2004). WHO advises hospitals to use plastic bags and sturdy containers for infectious waste, while general waste can be treated as domestic refuse, and sharps should be collected in puncture-proof containers (Prusset al., 1999).

Highly infectious waste should be sterilized via autoclaving, while cytotoxic waste requires leak-proof, labeled containers (Acharya et al., 2000). Sharps, needles, and syringes should be destroyed using needle destroyers, and items like infusion sets should be cut before disposal. Sodium hypochlorite should be used to disinfect sharps and soiled items, with fresh solutions made for each shift. Storage areas should be impermeable, well-drained, and easily accessible to waste collection vehicles (Srivastava, 2000). In tropical areas, infectious waste can be stored for up to 24 hours during hot seasons and 48 hours in cooler seasons (Pruss et al., 1999).

Waste transportation within hospitals requires dedicated, easily cleanable trolleys or carts, while offsite transport needs marked, cleanable vehicles with secure loads. Only trained staff should manage transportation on public roads, and disposable plastics should be shredded before disposal (Johannessen et al., 2000; Rao et al., 2004).

Despite advances in the healthcare sector, medical waste management in developing countries often receives insufficient attention, posing significant health risks (Coad, 1992; WHO, 1999; Oweis et al., 2005). WHO (1998) estimates that 85% of hospital waste is non-hazardous, 10% is infectious, and 5% is non-infectious but hazardous. Improving medical waste management is crucial for environmental and healthcare improvements, as illustrated by a study at King George Hospital in Visakhapatnam, India, where increased awareness and the establishment of a control committee were deemed necessary for effective management (Sharmila et al., 2005).

Management in Africa

The situation regarding medical waste management in Africa is critical, with various reports highlighting poor practices across the continent. In Tanzania, medical waste management has been described as inadequate, with a general lack of awareness among those generating and handling waste (Leonard, 2004; Manyele, 2003). Despite these challenges, recent efforts have led to the construction of 13 pilot small-scale incinerators (SSI) across the country, a success that motivated the expansion of these facilities to all referral, regional, and district hospitals (Manyele, 2004).

In South Africa, medical waste management is also a significant problem, with improper disposal practices being widely reported. The incineration of medical waste has raised concerns due to its association with health issues such as hormonal disruptions, immune and reproductive system problems, and even cancer (Groundwork, 2002). In KwaZulu-Natal alone, about 45% of healthcare waste is unaccounted for, suggesting illegal dumping, burial, or burning, which poses risks to public health and the environment (Leonard, 2004). The country's capacity to manage the large volumes of medical waste is inadequate, leading to instances where medical waste has been illegally dumped in residential areas. Such incidents have resulted in dangerous situations, such as children playing with hazardous materials, including syringes, which has led to severe health risks (Leonard, 2004).

Management in Nigeria

In Nigeria, a national plan was developed to provide viable technical options as well as a roadmap for the management of healthcare waste for 5 years. The National HCW Management Plan of Action is a document intended for use by health managers and program officers across the health sector (including those in the private health sector). The purpose of developing this plan was to provide a tool that gives health managers guidance in planning, implementing and monitoring the activities of health care waste management in health facilities. This plan describes the situation of health care waste management on the basis of a desk review and a survey which were conducted in order to document the situation of waste management in Nigeria. (MOH, 2006)

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Policy frameworks on management of wastes

The National Policy on Injection Safety and Medical Waste Management (2007) was created to safeguard health workers, patients, and communities by promoting safe injection practices and proper medical waste management. As the first Ministry of Health and Social Welfare document specifically addressing health waste management, the policy aims to support the implementation of effective medical waste practices. Key principles include establishing organizational structures for waste management, protecting the environment through proper disposal, minimizing risks with safer injection devices and sharps disposal, and enhancing human resource capacity via training (National Policy on Injection Safety and Medical Waste Management, 2007).

The policy emphasizes the need for financial support, ensuring a continuous supply of equipment, and promoting behavior change communication for best waste management practices. In Nigeria, medical waste management faces significant challenges, with studies revealing that 39% of generated waste is infectious—far higher than the WHO standard of 20% infectious and 80% non-infectious (MoH, 2006). The average waste produced per patient per day is 0.525 kg, and waste burning, which releases toxic substances such as dioxins and furans, is a major concern. Research from Nairobi shows that municipal and medical waste contribute significantly to waste generation, potentially creating Unintentionally Persistent Organic Pollutants (U-POPs) (UNEP, 2000). In Lagos, approximately 2000 tons of waste are generated daily, with only 25% being collected (UNEP, 2000).

Nigeria's legal framework, such as the Environmental Management and Coordination Waste Management Regulations, addresses waste disposal and hazardous waste control. However, the lack of a functional waste management system, legal guidelines, public awareness, and administrative challenges have led to the prevalence of waste burning. A holistic approach is recommended, including clear responsibility assignments, occupational health programs, and waste minimization and segregation efforts (MoH, 2007). This strategy seeks to improve medical waste management, enhance facility cleanliness, and reduce community health risks through policy implementation.

Medical waste management involves a range of engineering tasks like collection, transportation, treatment, and disposal, with initial segregation typically handled by nursing staff. Proper handling is critical to mitigate health and environmental hazards (Patil et al., 2005). This study focuses on evaluating medical waste management practices at Federal Medical Centre, Owo.

RESEARCH METHODOLOGY

Introduction

This chapter discusses the procedure that is adopted in carrying out this study. It focuses on the research design, area of the study, population of the study, sample and sampling technique, instrument for data collection, validation of the instrument, reliability of the instrument, method of data collection and method of data analysis.

Research design

The research methodology employed in this study was a cross-sectional design, which is a type of observational research that involves analyzing data from a sample population or pre-defined subset at a specific point in time. The study took place at a hospital, and data collection specifically occurred during the months of June and July in 2024.

Population of the study

The population of the study comprised of doctors, nurses and support staff selected in FMC.

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Inclusion criteria

All the health care providers' who are employees of FMC and have worked there for more than 6 months (i.e. doctors, nurses and support staff) and those who were willing to participate in the study.

Sampling procedure

Sample size determination

Size was calculated using the (Fischer's *et al.,* 1998) formulae.

$N=Z^2* \underline{P (1-P)} d2$

Where

Z – is a constant. (1.96)

α - Confidence interval

P – Anticipated population proportion, 60% level of awareness done in Nigerian hospitals, according to the survey done in 2007 on the strategic plan for biomedical waste management (MoH, 2007) d – Absolute precision (0.05) Therefore$1.96*0.6*0.4/ (0.05)^2 =$ 370 (sample size). Sample size is 370 and an additional 5 % additional for non-response

Finite population correction-The Usage of the equation for the standard error of the mean assumes a population that is infinite and it is usually employed as it stands with populations that are infinite or are vast enough to consider them infinite for practical purposes. But for too large to sample in its entirety and too small to label as practically infinite, we must add the population correlation factor to the end of the equation.

$$N= \frac{\text{No (in this case is 370 i.e. the sample size)}}{1+ \quad \text{no (which is 370)}}$$

N (the total sample population)

Therefore=370/1+370/788=246

Sampling procedure

A listing of eligible participants was conducted according to their respective departments. Proportionate allocation was done to determine the number to be sampled per stratum (department). In each stratum random sampling was carried out to select the required sample using the random number tables. In case the recruited participant did not give consent, the next consenting participant was included in the study. Sampling was done in repeated visiting days until the desired numbers of respondents was achieved.

Data Collection, Management and Analysis

Data collection

A structured questionnaire was used to collect the data. It consisted of:

1. Items regarding the demographic variables: gender, duration of work, source of information, number of trainings, level of training.
2. Knowledge items regarding biomedical waste management: categories of waste, segregation, collection, treatment, disposal, universal work precautions of biomedical waste management.
3. The practices included segregation, color coding, storage and transportation, labeling, treatment and disposal, records of the wastes, final waste disposal among others.

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The questionnaires were administered face to face. The following is the way it was carried out:

Doctors: Due to the nature of their job, the investigator ensured they conducted the interviews when the doctors were having their lunch breaks or their tea breaks in the various cafeterias in the departments or tea rooms as they would call them.

Nurses: The same method as that used with the doctors was employed. The lunch breaks and tea breaks were made use of since they are also very busy.

Support staff: The interviews for the support staff were also conducted during their tea and lunch breaks since they do not work throughout. This therefore reduced contamination since data was collected off-site.

Data management

Data from the questionnaires was entered into a computer database designed using MS application software. Measures were put to minimize entry errors on the entry screen. The data entering process was conducted concurrently as the data collection continued. Data cleaning and validation were also performed to achieve a clean set that was then exported as a quantitative program for social and market research (z-QPSMR). Clean sets of data were backed up in a Compact Disk (CD) and flash disc. They were also stored in hard drive disks in the computer ready for analysis. A back up of these data was done regularly to avoid any loss or tampering. All the filled questionnaires were arranged in folders and properly kept in lockable cabinets. They were directly accessible only to investigators. Access to computers was for authorized users only.

Data analysis

1. Descriptive analysis was done. Proportions, and Mean percentages to compute demographic variables.
2. Inferential statistics such as chi- square were also used.

Ethical clearance

Permission was obtained from the authorities at FMC, where the study was scheduled to be conducted and informed consent was obtained from the health care providers who were willing to participate in the study. Confidentiality was enhanced throughout the study process, including the process of data collection and in reporting. Coding was used instead of the names of the participants hence protection of their privacy. Important to note also is that the investigator did not directly come into contact with the biomedical waste and hence safety was upheld as data was being collected

DATA PRESENTATION AND ANALYSIS

Demographic Characteristics Of The Study Population

Distribution of the study population, according to profession, Gender, department, job status, duration of service and level of education

The study comprised of a total sample size of 244 health workers. Nurses were the majority with 129(53%) followed by support staff with 98(40%) and finally doctors had the least sample size of 17(7%).Distribution by Gender indicated that Female employees were the majority, recording 148(60%) and their male counterparts constituted 96(40%).An analysis of staff by the department indicated that in the Accident and Emergency department nurses recorded 32(80%)while doctors were 8(20%); the orthopedic department had 34(94%) nurses and 2(6%) doctors while General Surgery had 90% nurses and 10% doctors. Since Support staff does not have specific workstations, they were not categorized by department.

In terms of employment the results revealed that 63(90%) of the total sample were permanently employed, 7(7%) were on contract while there was only 1 volunteer who constituted 0.4%.With regards to the duration of time worked in the Hospital, 152(62%)of the total Sample had worked for more than 5 years,56(23%) had worked for between 3-4 years while 36(15%) had worked for 1-2 years.In terms of Respondents level of

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education, the results revealed that majority of staff were holders of diploma certificates with a total score of 45.9%.

Table 4.1: Demographic distribution of the study population sample

Category	Total	Doctor	Nurse	Support Staff
Total	244 (100%)	17 (7%)	129 (53%)	98 (40%)
PROFESSION				
Doctor	17 (7%)	17 (100%)	0 (0%)	0 (0%)
Nurse	129 (53%)	0 (0%)	129 (100%)	0 (0%)
Support Staff	98 (40%)	0 (0%)	0 (0%)	98 (100%)
GENDER				
Male	96 (40%)	15 (16%)	22 (23%)	59 (61%)
Female	148 (60%)	2 (1%)	107 (72%)	39 (26%)
DEPARTMENT				
Accident & Emergency	40 (16%)	8 (20%)	32 (80%)	0 (0%)
Orthopedic	36 (15%)	2 (6%)	34 (94%)	0 (0%)
General Surgery	70 (29%)	7 (10%)	63 (90%)	0 (0%)
JOB STATUS				
Permanent/Contract	220 (90%)	14 (6%)	111 (50%)	95 (43%)
Intern	7 (3%)	1 (14%)	6 (86%)	0 (0%)
Volunteer	1 (0.4%)	0 (0%)	1 (100%)	0 (0%)
LENGTH OF WORK				
1-2 years	36 (15%)	6 (17%)	18 (50%)	12 (33%)
3-4 years	56 (23%)	3 (5%)	27 (48%)	26 (46%)
>5 years	152 (62%)	8 (5%)	84 (55%)	60 (39%)
EDUCATION LEVEL				
PhD	1 (0.4%)	0 (0%)	1 (100%)	0 (0%)
Masters	4 (1.6%)	3 (75%)	1 (25%)	0 (0%)
BSc	23 (8.2%)	14 (61%)	9 (39%)	0 (0%)
Higher Diploma	41 (16%)	0 (0%)	40 (97%)	1 (3%)

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Assessment Of The Level Of Awareness On Medical

Waste Management

Assessment of awareness by the study population on correct segregation of medical wastes.

It was noted that 44% of the entire study population was aware of the correct color coding scheme to use in disposing the different types of medical wastes (Table 4.2). The results indicated that doctors (50%) were the most aware of the correct segregation practices, followed by the support staff (46%) and lastly nurses (41%).

Out of all the medical wastes, infectious wastes were the wastes that most of the study populations were least aware of on the correct way of segregation. Only 23% of the study population were aware of the correct segregation of infectious wastes, with doctors (18%) being the least aware of the correct segregation of infectious wastes as compared to other wastes. Majority, (65%) of the study population, were aware of the correct segregation of paper/food stuff. It is important to note that as shown in the table 4.2 below, not all the study population were aware of the different medical wastes hence the differences in the totals for the different waste categories.

Table 4.2: Assessment of Medical Wastes segregation into correct color code scheme according to the study population

Category	Base Total	Doctor	Nurse	Support Staff
	N	N%	N	N%
Infectious	239	54 (23%)	27 (21%)	24 (25%)
		3 (18%)		
Anatomical	210	121 (58%)	109 (53%)	87 (53%)
		14 (64%)	9 (61%)	
Chemical	185	104 (56%)	94 (51%)	76 (39%)
		15 (60%)	9 (60%)	
Pharmaceutical	170	53 (31%)	91 (40%)	67 (27%)
		12 (58%)	7 (21%)	
Paper/Food Stuff	204	133 (65%)	110 (65%)	81 (53%)
		13 (54%)	7 (66%)	
Radioactive/Genotoxic	145	40 (28%)	76 (34%)	62 (21%)
		7 (43%)	3 (21%)	
Correct Code (Mean Score)		**44.00%**	**50.00%**	**41.00%**

Assessment of reasons for failure to use the colour coding scheme for waste segregation according to the study population

The study also sought to find out why the study population did not use the colour coding scheme always. The results showed that inadequacy of the segregation papers was the major reason as to why they did not always use the colour coding scheme.

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(Table 4.3)

Table 4.3: Assessment of reasons for failure to use the color coding scheme always accordingto the study population Support

Reason	**Total (95)**	**Doctor (4)**	**Nurse (55)**	**Staff (36)**
No coded containers	11 (12%)	1 (25%)	6 (11%)	4 (11%)
Inadequate containers	78 (82%)	3 (75%)	48 (87%)	27 (75%)
Inaccessible containers	10 (11%)	2 (50%)	3 (5%)	5 (14%)
Any other	1 (1%)	0 (0%)	0 (0%)	1 (3%)

Assessment of the level of awareness of other medical waste management practices by professionals

Apart from segregation, the study also sought to find out the level of awareness of the study population on various medical waste practices such as awareness on the level at which sharps containers should be taken for incineration, the level at which the waste containers should be taken for incineration, whether they were aware that needles should never be recapped, whether they were aware of the universal precaution rule and also whether they were aware of the government plan on medical waste management. Results showed that 62% of the study population was aware of these important aspects of medical waste management. Doctors had an average of% on the awareness of these aspects, nurses had 68% while the support staff had 57 %.

The overall awareness therefore of medical waste management was found to be 51%, with the doctors overall score being 48%, nurses scoring 54.5% and the support staff scoring 51.5%.

Assessment Of The Current Practices On Medical Waste Management

Assessment of the current practices on waste storage, hand washing facilities and handling of wastes before treatment and disposal by the study population at FMC.

According to the results, there is special equipment for sharp waste handling and an efficient temporary storage facility at FMC according to 227(93%) of the study population .An assessment of the condition of the storage facility indicates it's in good condition according to the healthcare personnel since all factors that determine an efficient storage facility recorded over 80%, i.e. its fenced, big enough, well ventilated and that only authorized personnel are allowed in the facilities illustrated in figure 4.1

There is also availability of a hand washing Facility and Plastic containers for disposal. Medical waste is temporarily handled before treatment and disposal according to 222(91%) of the study population. There is 1 incinerator that is in good condition at FMC with a capacity to hold <500kgs of waste. The incinerator is always in a good state according to 152(80%) of the study population. Waste takes one day before it's treated and disposed and there is an average of 11 containers in the various departments as illustrated in the table 4.5.

Table 4.5: Availability and condition of MW Management Facilities at FMC according to the study population

Category	**Total (244)**	**Doctor (17)**	**Nurse (129)**	**Support Staff (98)**
Total	244 (100%)	17 (100%)	129 (100%)	98 (100%)
Is there special equipment for sharp waste handling?	Yes (241) (98.77%)	Yes (17) (100%)	Yes (127) (98.45%)	Yes (97) (98.98%)

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Is there a temporary storage facility?	Yes (227) (93%)	Yes (13) (76%)	Yes (119) (92%)	Yes (95) (97%)
Is there a hand washing facility?	Yes (241) (99%)	Yes (17) (100%)	Yes (127) (98%)	Yes (97) (99%)
Is there a specific area for health care waste disposal?	Yes (243) (100%)	Yes (17) (100%)	Yes (128) (99%)	Yes (98) (100%)
Number of Incinerators				
1	71 (29%)	24 (12%)	38 (29%)	31 (32%)
2	50 (20%)	2 (12%)	18 (14%)	30 (31%)
3	65 (27%)	9 (53%)	44 (34%)	12 (12%)
Capacity of Incinerators				
5-30 Kgs	4 (2%)	0 (0%)	1 (1%)	3 (1%)
100-175 Kgs	2 (1%)	0 (0%)	0 (0%)	1 (1%)
200-400 Kgs	22 (9%)	0 (0%)	12 (9%)	10 (10%)
>500 Kgs	88 (36%)	5 (29%)	36 (28%)	47 (48%)
Condition of Incinerators				
Good	156 (64%)	4 (24%)	74 (57%)	78 (80%)
Fair	34 (14%)	1 (6%)	18 (14%)	15 (15%)
Don’t Know	54 (22%)	12 (71%)	37 (29%)	5 (5%)
How often are incinerators in good/fair condition?				
All the time	190 (80%)	2 (100%)	92 (72%)	93 (84%)
Sometimes	30 (16%)	5 (40%)	16 (4%)	12 (13%)
Most times	8 (4%)	1 (20%)	4 (4%)	3 (3%)
Number of containers present (Mean Score)	11	15	9	10
By Department				
Accident & Emergency	15			
Orthopedic	9			
General Surgery	10			

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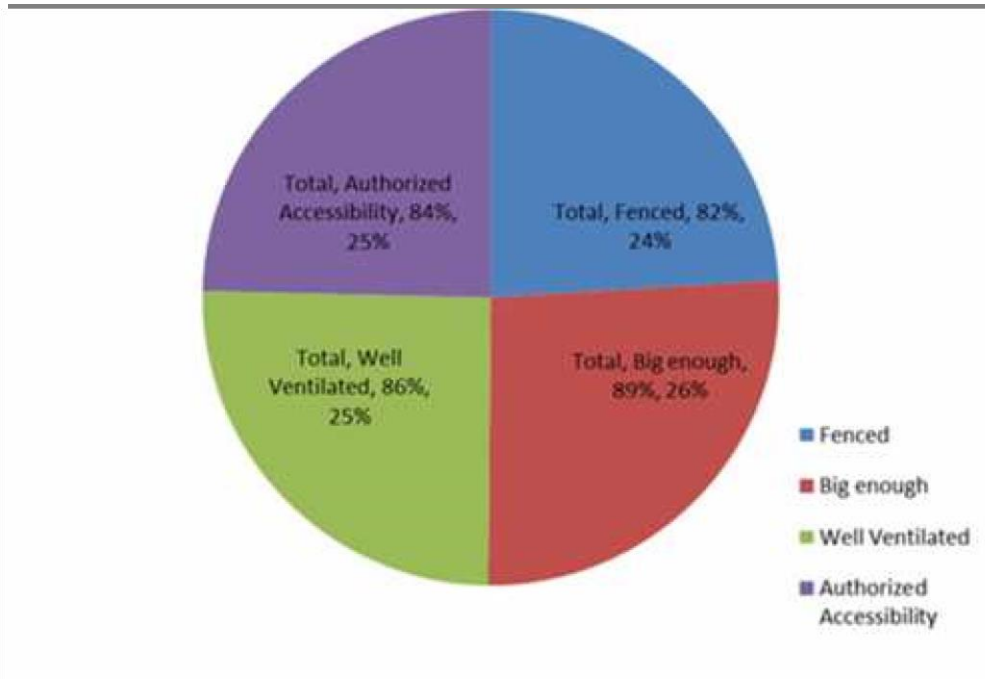

Figure 4.1 Condition of storage facilities according to the study population and their frequencies.

Assessment of current practices by study population in waste generation record keeping and use of equipment

n the study, 91% of the participants reported that medical waste is temporarily handled for one day before treatment and disposal. Record-keeping for waste generated was noted by 41% of the population. Plastic containers are used for waste disposal, and medical waste collection at FMC is scheduled daily. Incineration, performed daily, is the predominant method of medical waste treatment, reported by nearly 100% of the participants, followed by autoclaving (60%) and burning (58%). Additionally, 86% of the study population indicated that a truck or lorry is used to transport medical waste within the hospital.

Table 4.6: Assessment on correct MW handling practices according to the study population

Category	**Total (244)**	**Doctor (17)**	**Nurse (129)**	**Support Staff (98)**
Total	244 (100%)	17 (100%)	129 (100%)	98 (100%)
Handling of waste temporarily before treatment and disposal	222 (91%)	13 (76%)	116 (90%)	93 (95%)
1 day storage of waste before further action	185 (83%)	10 (77%)	98 (84%)	77 (83%)
Waste handler weighs and keeps record of waste generated	99 (41%)	3 (18%)	44 (34%)	52 (53%)
Plastic container is used for disposal	243 (100%)	17 (100%)	128 (99%)	98 (100%)
Have a routine schedule for the collection of MW (Medical Waste)	215 (88%)	10 (59%)	111 (86%)	94 (96%)

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Daily collection of MW	214 (99%)	10 (100%)	111 (100%)	93 (99%)
Daily transportation of MW	238 (98%)	15 (88%)	125 (97%)	98 (100%)
Daily incineration of waste	198 81%	9 53%	100 78%	89 91%

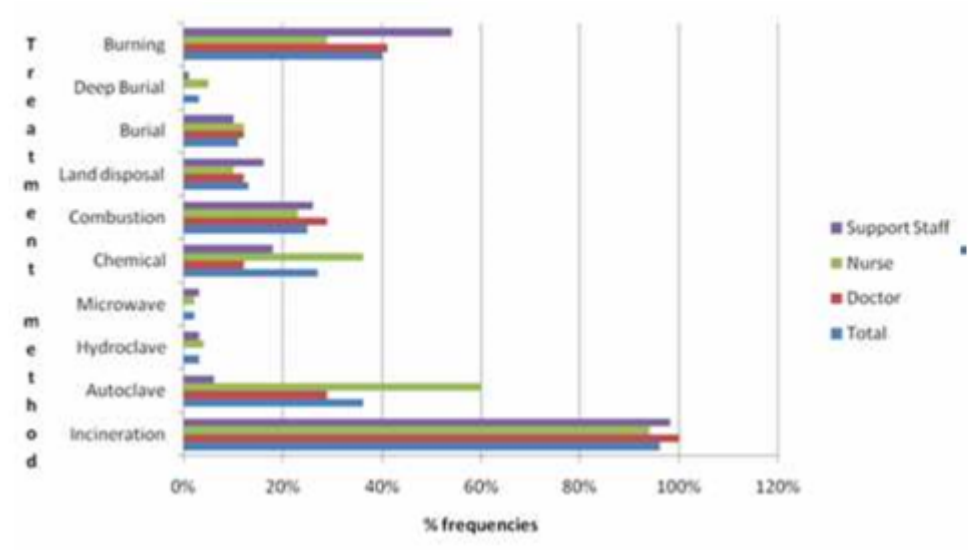

Figure 4.2 Methods used for medical waste treatment and their frequencies according to the study population.

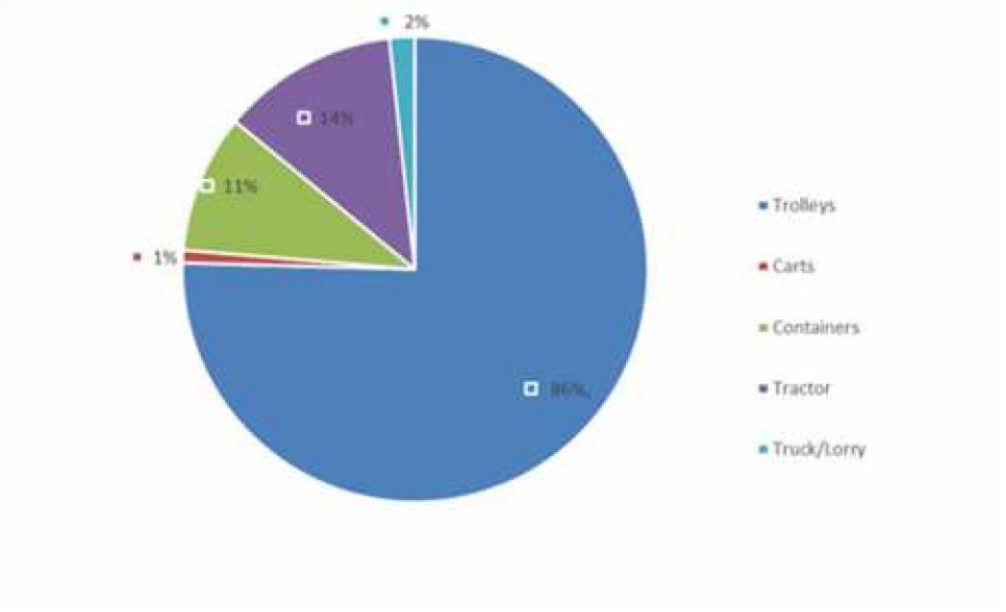

Figure 4.3 Methods used to transport medical wastes at FMC and their frequencies.

Assessment of the Factors Associated With Correct Medical Waste Management

The study also sought to assess the significance of factors thought to influence awareness levels which included level of education, training on medical waste, Years of work experience and profession.

Assessment of the level of Education in relationship to correct medical waste management

On medical waste management awareness levels by level of education, 55.7 % constituting Diploma/Higher diploma holders stated that sharps are taken for incineration at ¾ full with PHD/Masters and those below

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diploma certificates rating at 37% and 43.5% respectively. However with chi square values of $X^2(2 , N=244) = 5.477$, P = 0.065 the result of this category was not statistically significant as the P value was greater than 0.05.On emptying of waste containers 46% which included PHD/Masters/BSC stated that they empty waste containers at ¾ full with Diploma/Higher diploma and those below diploma category rating at 50.9% and 65.2% respectively. With the chi square values of $X^2(2, N=244) = 6.207$, P = 0.045 the relationship was significant as the P Value was less than 0.05.

On recapping used needles by hand 65.1% constituting Diploma/higher diploma holders said that they never recap used needles by use of hands. Below diploma and PHD/Masters/BSC Certificate holders scored 45.7% and 43.5% respectively. With the chi square results of $X^2(2, N=244) = 9.864$, P = 0.007 the relationship was significant as the P value was less than 0.05.On awareness of universal precaution rule and government plan on medical waste management 90.6% and 80.2% respectively of Diploma/Higher Diploma graduates were knowledgeable of these aspects. PHD/Masters/BSC certificate holders scored. 73.9% and 63.0% respectively while Staff with below diploma certificates rated at 78.3% and 65.2% respectively. With $X^2(2, N=244) = 8.366$, P = 0.015 and $X^2(2 , N=244) = 7.29$, P = 0.026 the relationship was significant.

On average diploma/higher diploma holders were more knowledgeable of better MW practices and standards, at 69% followed by below diploma, at 60% and finally PHD/Masters/BSC at 53%. The mean chi square results $X^2(2 , N=244) = 7.4408$, P = 0.0316 indicated a significant relationship between level of education and awareness on correct practices as the P Value was less than 0.05.Table 4.7

Table 4.7: Awareness on MW Management by level of education

Category	**Total**	**PhD/Masters/BSc**	**Diploma/Higher Diploma**	**Below Diploma**	**Chi-Sq. (x^2)**	**DF**	**P-Value**
Level at which sharps are incinerated (3/4 Full)					5.477	2	0.065
N	244	116	128	59			
N%	100%	48%	37%	55.70%			
Not 3/4 Full							
N	116	17	29	40			
N%	52.50%	63.00%	44.30%	57%			
Level of emptying waste containers (3/4 Full)					6.207	2	0.045
N	244	135	109	60			
N%	55%	46%	50.90%	65.20%			
Not 3/4 Full							
N	109	25	52	32			
N%	45%	54.30%	49.10%	34.80%			

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Frequency of recapping used needles by hand (Sometimes)					9.864	2	0.007
N	244	113	131	69			
N%	46.30%	56.50%	34.90%	54.30%			
Never							
N	131	37	50	42			
N%	53.70%	43.50%	65.10%	45.70%			
Aware of universal precaution rule					8.366	2	0.015
Yes	202	34	96	72			
N%	83%	73.90%	90.60%	78.30%			
No	42	12	10	20			
N%	17.20%	26%	9.40%	21.70%			
Aware of Government Plan on MW Management					7.29	2	0.026
Yes	174	70	85	60			
N%	71.30%	63%	80.20%	65.20%			
No	70	29	17	60			
N%	28.70%	37%	20%	34.80%			
% Mean Scores		62%	53%	69%	7.4408	2	0.0316

Assessment of the level of training in relationship to correct medical waste management

An assessment of awareness by training indicated that 58.4% constituting those who attended training were aware that sharps should be incinerated at ¾ full with the Chi square statistics $X^2(1, N=244) = 14.755$, $P = 0.00$ indicating a significant relationship as the P Value was less than 0.05. On emptying of waste containers 65.7% comprising those who attended training stated that they empty waste containers at ¾ full while those who did not attend training constituted 42.1%.with the Chi square values of $X^2(1, N=244) = 13.581$, $P = 0.00$, this result was highly significant as the P Value was less than 0.05

On frequency of recapping used needles by hand 59.10% comprising of those who attended training said they never recap used needles by hand with the chi square result, $X^2(1, N=244) = 3.712$, $P = 0.054$ indicating the relationship not being significant since $P>0.05$. On awareness of universal precaution rule and government plan on Bio medical waste management 89.1% and 78.1% respectively comprising of trained employees were

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knowledgeable of these aspects. With $X^2(1 , N=244) = 8.603$, P = 0.003 and $X^2(2 , N=244) = 7.042$, P = 0.008, the relationship was statically significant as the P Values were less than 0.05.

On average, 70% constituting those who attended training were more knowledgeable of better MW practices and standards while those who did not attend training constituted an average mean score of 52%. The mean chi square results $X^2(1, N=244) = 9.5386$, P = 0.013 indicated a significant relationship between training and awareness on correct practices as the mean P Value was less than 0.05. See table 4.8

Table 4.8:Awareness on MW Management by Training attendance

Category	Level/Action	N%	Not 3/4 Full (N)	Total	Chi-Square (χ^2)	DF	P-Value
Level at which sharps are incinerated	3/4 Full (N)	47.50%	116	128	14.755	1	0
	Not 3/4 Full (N)	52.50%	80	57			
Emptying waste containers	3/4 Full (N)	55.00%	135	109	13.581	1	0
	Not 3/4 Full (N)	45.00%	90	47			
Recapping used needles by hand	Sometimes (N)	46.30%	113	131	3.712	1	0.054
	Never (N)	53.70%	56	81			
Aware of universal precaution rule	Yes (N)	82.80%	202	42	8.603	1	0.003
	No (N)	17.20%	122	80			
Aware of Government Plan on MW Management	Yes (N)	71.30%	174	70	7.042	1	0.008
	No (N)	28.70%	107	67			
% Mean Scores		62%	70%	52%	9.5386	1	0.013

Assessment of the duration of work experience in relationship with correct medical waste management

In terms of duration of work experience 51.3% constituting respondents with over 5 years of work experience said that sharps are taken for incineration at ¾ full and.2% said that sharps are emptied at ¾ full. On frequency of recapping used needles by hand 57.20% comprising of those with over 5 years of work experience stated that used needles are never recapped.

On awareness of universal precaution rule and government plan on medical waste management 81.6% and 69.7% respectively comprising of respondents with over 5 years of work experience were knowledgeable of these aspects. However with $X^2(1,N=244) = 2.30$,P = 0.13 for level at which sharps are generated, $X^2(1 ,N=244) =2.30$,P = 0.13 for level of emptying waste containers, $X^2(1 ,N=244) = 2.041$,P =0.153 for frequency of recapping used needles by hand, $X^2(1 ,N=244) = 0.413$,P =0.521 for awareness on universal precaution rule and $X^2(1,N=244) = 0.489$,P = 0.485 for awareness of Government plan on Medical Waste

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Management the chisquare results did not reflect significant relationships as all the P Values were greater than 0.05. On average 59% of personnel who have 1 to 4 years of work experience were aware of correct MW standards and practices while those with over 5 years of work experience had a mean score of 64%.However the mean chi square results $X^2(1 , N=244) = 1.5086$, $P = 0.2834$ indicated that there was no significant relationship between awareness and number of years served as the P Value was greater than 0.05.

Table 4.9: Awareness on MW Management by Number of Years

Category	**Level/Action**	**N%**	**Not 3/4 Full (N)**	**Total**	**Chi-Square (χ^2)**	**DF**	**P-Value**
Level at which sharps are incinerated	3/4 Full (N)	47.50%	116	128	2.3	1	0.13
	Not 3/4 Full (N)	52.50%	38	54			
	1-4 Years	41.30%	78	74			
	> 5 Years	51.30%	38	54			
Level of emptying waste containers	3/4 Full (N)	55.30%	135	109	2.3	1	0.13
	Not 3/4 Full (N)	44.70%	45	47			
	90%	59.20%	62	62			
Frequency of recapping used needles	Some/Most times (N)	46.30%	113	131	2.041	1	0.153
	Never (N)	53.70%	44	87			
Aware of universal precaution rule	Yes (N)	82.80%	202	42	0.413	1	0.521
	No (N)	17.20%	78	124			
Aware of Government Plan on MW Management	Yes (N)	71.30%	174	70	0.489	1	0.485
	No (N)	28.70%	68	106			
% Mean Scores		62%	59%	64%	1.5086	1	0.2834

Assessment of the profession in relationship with correct medical waste management

The study also sort to find out the relationship between profession and awareness levels.56.6%,37.8% and 35.3% of Nurses, Sanitary Staff and Doctors respectively stated that sharps are taken for incineration at ¾ full. This was significant at $X^2(2 , N=244) = 9.02$, $P = 0.011$ as the P value was less than 0.05.On Emptying of waste at ¾ full 53.5%, 61.2% and 35.3% constituting Nurses, Sanitary Staff and Doctors respectively stated waste containers are emptied at ¾ full. However this category was significant at $X^2(2 , N=244) = 4.316$, $P = 0.116$ as the P value was greater than 0.05.On frequency of recapping used needles by hand 60.5%, 45.9% and 47.1% of Nurses, Sanitary Staff and Doctors respectively said that used needles are never recapped by hand.

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However this was not significant as the result, $X^2(1 , N=244) = 5.063$, P = 0.008 indicated with P being greater than 0.05

On awareness of universal precaution rule and government plan on Bio medical waste management 87.6%, 79.6% and 82.8% of nurses Sanitary Staff and Doctors respectively were aware of universal precaution rule on MW while 81.4%, 62.2% and 47.1% nurses, sanitary Staff and Doctors respectively were aware of Government Plan on MW Management. Chi square statistics $X^2(1 , N=244) = 6.697$, P = 0.035 for Awareness on universal precaution rule and $X^2(1 , N=244) = 15.237$, P = 0.00 for awareness on Government Plan on MW indicated significant relationships.On average Nurses were more aware of better MW practices and standards, at 68% followed by Sanitary Staff at 57% and finally Doctors at 46%. The Mean chi square results $X^2(2, N=244) = 8.0666$, P = 0.0484 indicated that there was a significant relationship between Profession and awareness on proper practices and standards of MW

Table 4.10: Awareness on MW Management Practices by Profession

Category	**Level/Action**	**N%**	**Doctors**	**Nurses**	**Sanitary Staff**	**Chi-Square (χ^2)**	**DF**	**P-Value**
Level at which sharps are incinerated	3/4 Full (N)	47.50%	116	6 (35.30%)	73 (56.60%)	9.02	2	0.011
	Not 3/4 Full (N)	52.50%	128	11 (64.70%)	56 (43.40%)			
Level of emptying waste containers	3/4 Full (N)	55.30%	135	6 (35.30%)	69 (53.50%)	4.316	2	0.116
	Not 3/4 Full (N)	44.70%	109	11 (64.70%)	60 (61.20%)			
Frequency of Recapping used needles by hand	Sometimes (N)	46.30%	113	9 (52.90%)	51 (39.5%)	5.063	2	0.08
	Never (N)	53.70%	131	8 (47.1%)	78 (60.5%)			
Aware of universal precaution rule	Yes (N)	82.80%	202	11 (64.7%)	113 (87.6%)	6.697	2	0.035
	No (N)	17.20%	42	6 (35.3%)	78 (79.6%)			
Aware of Government Plan on MW Management	Yes (N)	71.30%	174	8 (47.1%)	105 (81.4%)	15.237	2	0
	No (N)	28.70%	70	9 (52.9%)	61 (62.2%)			
% Mean Scores		62%	46%	68%	57%	8.0666	2	0.0484

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DISCUSSION

Awareness on medical waste management by the study population at FMC, Owo

Waste segregationAccording to WHO guidelines, hospitals should provide plastic bags and strong plastic containers for infectious waste, which must be marked with a Biohazard symbol (Pruss et al., 1999). The study revealed that awareness of infectious waste was low, with only 23% of participants knowledgeable about its proper management. Among doctors, only 18% were aware of correct segregation practices, consistent with findings from a similar study in India that reported a lack of awareness about medical waste management (Management & Handling Rules, 1998). Radioactive/genotoxic waste awareness was also low at 28%, while awareness of paper/food waste segregation was higher at 65%, likely due to more frequent encounters with such waste. Overall awareness of waste segregation was 44%, with doctors scoring the highest at 50%, followed by support staff at 46%, and nurses at 41%. This contrasts with a study at King George Hospital in Visakhapatnam, where only 11% of doctors, 32% of paramedical staff, and 25% of class IV staff were aware of waste segregation guidelines (Sreegiri et al., 2009). In FMC, doctors demonstrated greater awareness compared to those at King George Hospital. General waste separation at FMC was practiced to an above-average extent of 65%.

Sharps disposal

Sharps are to be disposed when ¾ full and 48% of the study population were aware of that. The doctors were the least aware at 35.3% and the nurses were the most aware of this at 56.6%. This is compared to a study conducted in India where a descriptive study was conducted to assess the knowledge on preventive practice regarding needle stick injuries among 96 staff nurses at Mangalore. The result showed that 54.21 percent of participants knew that sharp disposal containers and puncture proof boxes and 55.35 percent of the nurses were aware that the sharp disposal containers are sent for incineration when the container is ¾ full. Exposure to biomedical waste increases the risk of acquiring infection. Nurses and other health care personnel must be made aware of the risks so that they can improve their practices with regard to medical waste management. As now a day's nurses are required to practice in expanded roles in variety of settings they have to be very responsible and ecologically sensitive in accessing the environment impact of their services and in providing ways to reduce the hazards. (Sristhi, 2000)

Not recapping used needles

Another parameter used to measure the awareness of medical waste management among the healthcare personnel was whether they were aware of the fact that used needles should never be recapped. 53.7% were aware of that with doctors scoring the lowest at 47%. 45.9% of the support staff was aware of the same and 60.5% of the nurses were aware of the same. According to the University of Colorado at Denver and health Sciences Centre, needles should never be recapped as it reduces the chances of needle-stick injuries.A similar study in India revealed that 22.92% of the respondent was aware that the wearing personal protective equipment minimizes sharp injuries. The study concluded that there were only a few staff nurses having knowledge about preventive practice regarding needle stick injuries including not recapping used needles. A lot more needs to be done in this area at FMC so as to ensure safety while using needles and to prevent infections through recapping used needles.

Universal precaution rule

In this study at FMC, 84% of the participants were aware of the Universal Precaution (UP) rule, which advises treating all human blood, bodily fluids, and potentially infectious materials as infectious. Specifically, 71% of doctors, 88% of nurses, and 81% of support staff were aware of this rule. These findings contrast with a study conducted in India, which evaluated knowledge and practices regarding bio-medical waste management and infection control among dentists in a teaching hospital; that study reported a lack of awareness of the Bio-medical Waste (Management & Handling) Rules, 1998 (Kishore et al., 2000).

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Practices

Waste generated in hospitals stems from various activities, including both general and medical waste. General waste is related to food preparation, administrative tasks, and landscaping, and is similar to household or municipal waste. Medical waste, however, arises from therapeutic procedures such as chemotherapy, dialysis, surgery, autopsies, biopsies, and injections. This includes infectious waste, contaminated sharps, radioactive waste, and hazardous chemicals (Prüss et al., 1999). The amount of waste produced in hospitals depends on factors like the number of beds, types of health services, the patients' socio-economic and cultural status, and the hospital's location (Askarian et al., 2004).

Waste storage, hand washing facilities and handling of wastes before treatment and disposal by the study population at FMC

The area where hospital waste is stored before being transported for final disposal is known as the temporary waste storage area. This area must be well-sanitized and secured, with access restricted to authorized personnel (Prüss et al., 1999). At FMC, the temporary storage facility is fenced, spacious, and only accessible to authorized staff. Waste is kept there until it is ready for off-site transport. According to a 2010 Nigerian government survey on medical waste management, waste collection in most hospitals occurred daily. The survey also found that 47% of hospitals had designated waste storage areas, though in some cases, disused rooms with leaking roofs were used for this purpose.

Assessment of current practices at FMC on waste generation, record keeping and use of some equipment

Medical wastes generated in hospitals are collected daily and transported by hospital staff to temporary storage areas. It is crucial that medical waste is moved within hospitals using wheeled trolleys, containers, or carts dedicated solely to this purpose. Staff handling this waste are required to use full personal protective equipment (PPE), including gowns, boots, and gloves. However, inadequate or improperly used PPE, combined with a lack of knowledge about its benefits, puts personnel at significant risk (MoH, 2007). The majority of waste taken off-site from hospitals consists of glass and domestic waste, and practices such as open burning and dumping continue alongside incineration. Many facilities transporting waste off-site do not maintain records of their contracted disposal activities. Among hospitals with incinerators, most were operational, while a quarter were either under repair or non-functional. Additional waste treatment options included compost pits for nonhazardous biodegradable waste and shredders, though shredders were rare.

Assessment of the factors associated with medical waste practices at FMC

Some behaviors are influenced by education and peer environments, with responsible practices being an ideal outcome. Despite global awareness among healthcare professionals regarding medical waste (MW) hazards and management, the level in India is reported as inadequate (Kishore et al., 2000). At FMC, education significantly affected healthcare personnel's awareness of MW management. Diploma/higher diploma holders were most knowledgeable (69%), followed by those with lower qualifications (60%), and PhD/Masters/BSc holders (53%). Chi-square results ($X^2(2, N=244) = 7.4408$, $P = 0.0316$) revealed a significant relationship between education and awareness, contrasting findings from Mathew et al. (2012) and Yadavannavar et al. (2012), which showed over half of doctors rated their MW management knowledge as ‘poor,’ particularly between graduates and postgraduates ($p<0.001$), likely due to being recent graduates.

Training also influenced MW management knowledge. Those trained averaged 70% knowledge, compared to 52% for those untrained. Chi-square results ($X^2(1, N=244) = 9.5386$, $P = 0.013$) indicated a significant relationship between training and MW awareness, aligning with Vienna et al. (2005), whose study showed that planned teaching programmes (PTP) improved B.Sc. nursing students' knowledge from 49.5% to 86.6% ($t = 22.56$, $p<0.001$). Ruby et al. (2006) found similar results among 150 staff nurses in Mangalore, with scores increasing from 13.25 to 32.75 ($p<0.001$) after PTP.

Years of service did not significantly impact MW awareness. Personnel with 1-4 years of experience showed 59% awareness, while those with over 5 years showed 64%. Chi-square results ($X^2(1, N=244) = 1.5086$, $P =$

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0.2834) indicated no significant relationship between experience and MW awareness.Professionally, nurses had the highest awareness (68%), followed by sanitary staff (57%) and doctors (46%). Chi-square results ($X^2(2, N=244) = 8.0666$, $P = 0.0484$) demonstrated a significant relationship between profession and MW awareness. This mirrors findings by Sreegiri et al. (2009) in a study at King George hospital, where only 11% of doctors, 32% of paramedical staff, and 25% of Class IV staff were aware of waste segregation and collection guidelines.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

The study examined assessment of medical waste management practice in selected hospital centre. From the findings, the study concluded that there is the awareness on medical waste management among the health care personnel in FMC, Owo. There are the current practices on medical waste management at FMC, Owo; and there are the factors associated with correct medical waste management.

Recommendations

Management should implement structured training sessions for all healthcare staff, especially doctors, to improve awareness of waste segregation and sharps disposal. Findings show a significant link between training and higher awareness levels, and Planned Teaching Programs (PTP) have proven effective in improving knowledge. Therefore special focus should be given to educating healthcare personnel about radioactive/genotoxic waste and infectious waste segregation practices, given the low awareness levels (28% and 23%, respectively).

Management should establish regular assessments and evaluations of medical waste management practices, particularly regarding sharps disposal and needle recapping, to ensure compliance with best practices. Although awareness of the Universal Precaution rule is relatively high, consistent reinforcement through workshops and briefings can help sustain and potentially increase adherence to safety protocols across all levels of healthcare personnel.

The findings reveal that nurses tend to have the highest levels of awareness, while doctors, who play a pivotal role in healthcare settings, show lower levels of knowledge in some areas. Thus management should ensure the safety of both healthcare personnel and patients, continuous training, regular assessments, and reinforced protocols are necessary. Effective waste segregation, proper sharps disposal, and adherence to universal precaution guidelines should be ensured. By addressing these gaps, FMC, Owo, can significantly improve its medical waste management practices, leading to a safer and more environmentally responsible healthcare system.

Management should encourage proper documentation and record-keeping for medical waste collection, handling, and off-site disposal to ensure accountability and proper management, aligning with safe and sustainable practices. At the same time, management should establish recognition programs for departments or individuals who consistently adhere to medical waste management protocols, further motivating staff to engage in proper waste handling.

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