MEDICAL WASTE GENERATION, COLLECTION AND STORAGE PRACTICES AMONG PRIMARY HEALTH CENTRES IN OWERRI ZONE, IMO STATE

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CERTIFICATION

This thesis on Medical Waste Generation, Collection and Storage Practices among Primary Health Centres in Owerri Zone Imo State, written by OKORO, EZINNE TERESINA, (Reg. N0: 20164998098) has been certified as meeting the requirements for Master's Degree thesis in Public Health, in Post Graduate School, Federal University of Technology, Owerri.

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I dedicate this work to the Almighty God.

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ABSTRACT

Medical waste management is to ensure that healthcare facilities are clean and equally to eradicate nosocomial infections. The study aimed to determine medical waste generation, collection and storage practices among Primary Health Centres in Owerri Zone, Imo State. The study employed descriptive cross sectional study, because it examined medical waste generation, collection and storage practices among Primary Health Centres. The survey was designed to use an observation checklist and questionnaires which was administered to 380 participants (nurses, lab technicians, doctors, community health officers, cleaners, environmental health officers) from a sample size of 38 Primary Health Centers. The collected data was entered into computer Software called Statistical Package for Social Sciences (SPSS) Version 21.0 and analysed using descriptive statistical analysis. The results were displayed in frequency tables and charts. The association between variables was determined with chi-square statistical test to show that there is a relationship between the location of primary health centers and the type of medical waste generated, significant relationship between knowledge of health workers and waste collection practices, significant relationship between the type of primary health center and medical waste storage. Other findings observed that most 121(31.8%) of the respondents were junior community health officers who had about 6- 12 years work experience. Majority 160 (42.1%) reported facilities had between 6-10 beds with an average of 5-10 bed occupancy in a week. Many facilities 224 (58.9%) do not weigh their waste but in all, general waste (45.0%) was the highest contributor of solid waste stream. More facilities 213 (56.1%) showed that there was no proper collection plan though waste was collected in a variety of receptacles. A fewer facilities 171 (45.0%) practiced waste segregation though poor colour coding was observed. Very many of the respondents 295 (77.6%) reported their facilities had inadequate storage containers and many were without lids. Many of the facilities 224(58.9%) have no specific/designated area for waste storage and 57(36.5%) of the respondents reported open dumping and 55(35.2%)store waste behind buildings. In conclusion, out of the 380 participants, 329 (86.6%) had no knowledge of any policy regarding waste management in their establishment hence, fair knowledge of the risks associated with poor waste handling was observed. There is a need for regular staff training and retraining in medical waste management and the use of personal protective equipment.

Keywords; Medical waste, Healthcare facilities, Waste management, Hazardous waste, Environmental pollution, Regulatory laws.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Medical waste is a broad term that includes all waste materials generated during the process of health care delivery. It can be within health care facilities, dental clinics, home/private care units, laboratories and research centers. or health care facilities such as hospitals, clinics, physician's office, dental practices, blood banks and veterinary clinics as a result of diagnosis, treatment, or immunization of patients and associated biomedical research (Rutal & Weber, 2005). The collective name for all processes involved in medical waste from generation to final disposal is called medical waste management.

The term waste management is an all-embracing term which covers collecting, sorting, processing, recycling and reusing materials that would otherwise be considered as useless.

In the process of healthcare delivery, medical waste is generated, which includes sharps, general waste, human tissues, body parts, body fluids and other infectious materials like chemicals, pharmaceuticals and radioactive substances (Baveja,

Muralidhar & Aggarwal, 2000). Health-care activities meant to protect health, and save lives generate waste of which about 20 %are hazardous and pose high risk of infection or chemical exposure. They also cause radiation exposure (International Committee of the Red Cross, 2011). Poor conduct in collection, storage, handling and disposal methods exercised during medical waste management causes some health hazards like hepatitis B and C virus, HIV, Tetanus, and injuries from cuts (WHO, 1999). Some other diseases which could be transmitted by contact with health-care wastes are urinary tract infections, respiratory tract infections, wound infections, bacteremia, and skin infections etc. (WHO, 2004). Medical waste also causes environmental pollution/hazards due to the unpleasant smell of the waste (Hossain, Santhanam, Nik-Norulaini & Omar, 2011). The management of hazardous medical waste material requires specific knowledge and regulations, and it must be carried out by specialists in the field. According to Patil and Pokhre, (2005), inadequate collection, storage, handling and disposal of medical waste affects both staff, patients and environment. This is because the hospitals represent a unique environment, providing healthcare to patients and a work environment for medical and other staff.

Medical waste management is a relatively new phenomenon and has caught the attention of governments all over the globe (Nosheen, Shamail, Amin & Khawaja, 2011). It is taking central place in the national health policies of many countries.

However, many countries still handle and dispose medical wastes together with domestic wastes, posing a great health risk to municipal workers, the public and the environment (Alagoz & Kocasoy, 2008).

Research carried out by Akinwale *et al* (2009) shows that in Nigeria, not many people are aware that medical waste contributes substantially to environmental pollution and hazards. This is shown by poor knowledge and systematic implementation approaches to proper medical waste management particularly in the areas of medical waste generation, collection and storage practices. This is, therefore, the reason for interest in this research work.

1.2 Statement of the Problem

Masses of health-care waste are usually observed around Primary Health Centers and other health –care facilities within the state. These are serious causes of infections, diseases and even sometimes death to inhabitants of these areas thereby reducing the longevity and overall quality of life in these affected areas (Awodele *et al.*,2016). Some of the reasons for these are;

The policy of health facilities regarding solid medical waste management are inadequate with regards to proper equipment procurement and usage for waste generation, collection, segregation and storage practices thereby leading to wrong use of medical waste collection containers for the different types of wastes generated in different sections of the health care facility, poor medical waste segregation at collection and treatment sites (Ezeudu et al., 2022). This eventually leads to improper medical waste disposal and its resulting effects on the environment and the lives around it.

Poor enforcement of regulatory laws on waste management causes poor compliance of health care facilities to these regulations. This leads to dumping of wastes incessantly within and around the environs of the healthcare facility without due consideration of the environmental damages like degradation, air pollution, exposure to rodents and pests. These eventually impact health care workers, patients,

visitors to the facility, people living in the vicinity of the facility, scavengers and the public at large.

There is poor knowledge of health care workers and waste handlers on the vast number of diseases which people are exposed to or could potentially contract from poorly sorted, treated or disposed medical waste (Akinwale *et el.,* 2009). There is also inadequate periodic, follow-up trainings to further enlighten them on these (Alagoz & Kocasoy, 2008). Inadequacy of funds for waste in primary health centers is another reason. This makes it difficult to enforce what the laws, policies and regulations say even when they exist. As a result, sufficient numbers and colours of receptacles cannot be purchased making colour coding and capacity building difficult (Ezeudu, *et al*., 2002). Due to these problems, this study therefore intends to determine medical waste generation, collection and storage practices among primary health centers in Owerri zone, Imo state. Also, from literature review, no previous study has been done on this in Owerri zone, hence, this is the gap which this research work intends to fill.

1.3 Objectives of the Study

1.3.1 General Objective

The overall objective of this study is to determine medical waste generation, collection and storage practices among Primary Health Centres in Owerri Zone,

Imo State.

1.3.2 Specific Objectives

To achieve the above overall objective the following are the specific objectives.

1. To assess the knowledge of health care workers and waste handlers on risks concerning waste handling among Primary Health Centers in Owerri Zone, Imo

State.

2. To determine the types of medical waste generated among Primary Health Centers in Owerri Zone, Imo State.

3. To determine the average quantity of medical waste generated in a day among

Primary Health Centres in Owerri Zone, Imo State.

4. To determine the different medical waste collection methods used among Primary Health Centres in Owerri Zone, Imo State.

5. To determine colour coding observance among Primary Health Centres in Owerri Zone, Imo State.

6. To determine medical waste storage methods used among Primary Health

Centres in Owerri Zone, Imo State.

1.4 Research Questions

The following research questions were posed to guide the study

1. Is there sufficient knowledge of health care workers and waste handlers on risks concerning waste handling among Primary Health Centers in Owerri Zone, Imo State?

2. What are the types of medical waste generated among Primary Health Centres in Owerri Zone, Imo State?

3. What is the average quantity of medical waste generated in a day among Primary Health Centres in Owerri Zone, Imo State?

4. What are the different medical waste collection methods used among Primary Health Centers in Owerri Zone, Imo State?

5. Is colour coding observed among Primary Health Centres in Owerri Zone, Imo State?
6. How are medical wastes stored among Primary Health Centres in Owerri Zone, Imo State?

1.5 Research Hypotheses

The following null hypotheses will be tested at 0.05 level of significance

HO_1: There is no significant difference between knowledge of health care workers and medical wastes collection in Primary Health Centers.

HO_2: There is no significant difference between the location of Primary Health Centers and the types of medical waste generated

HO_3: There is no significant difference between storage of medical waste and type of Primary Health Centers.

1.6 Significance of the Study

The Significance of this study is, it educates or brings to the consciousness of health workers and medical waste handlers, the hazards, dangers and diseases associated with poor handling of medical waste. This will therefore reduce these negative effects among people residing close to health care facilities. Hence, the public health of citizens will be improved. It is expected that this study will be of great assistance by creating more awareness among health care waste handlers on the importance of vaccination against hepatitis B and tetanus.

This will be useful to the ministry of health and the government at large by making them allocates appropriate resources in the budget to medical waste management. This study will be valuable to health care waste handlers by further buttressing the

importance of using personal protective equipment during heath care waste generation, collection and storage.

It will assist researchers and readers in knowledge acquisition and reference making. From this research work, they can find the current quantity of medical waste generated per day in Kg, the medical waste collection and storage methods used among the Primary Health Centers in Owerri Zone, Imo state.

It will also assist decision or policy makers adapt better approaches to effectively manage medical waste.

A publication of this work will serve as foundation, template or reference for anyone interested in carrying out research in an aspect or the full medical waste management. The materials and instrument used for this study can be followed for replicate research in other areas of Imo state and even the Southeastern part of Nigeria.

1.7 Scope of the Study

This study will cover medical waste generation, collection and storage practices among Primary Health Centres in Owerri Zone, Imo State. To achieve this, the study will focus on the following: types of medical waste generated among the primary health centers of the study area, average quantity of medical waste generated per day in kg. The

different ways of waste collection and colour coding observance in the primary health centers of the area will also be of interest. Finally, different storage methods used by PHC's as well as the knowledge of health care workers and waste handlers on the risks of waste management in the study area will be of determined.

1.8 Operational Definition of Terms

Medical Waste - This refers to the materials generated at health care facilities such as hospitals, clinics, physician's office, dental practices, blood banks and veterinary clinics ass a results of diagnosis, treatment or immunization of patients and associated biomedical research (Rutal & Weber, 2005).

Medical Waste Management - Means the management of waste produced by hospitals, clinics, and health care facilities using techniques that will check the spread of diseases (ICRC, 2011)

Primary Health Centre (PHC) - This is the basic structural and functional unit of the public health services in developing countries. PHCs were established to provide

accessible, affordable and available primary health care to people in accordance with the Alma Ata declaration of 1978 by the member nations of the

World Health Organization (WHO).

Owerri Zone, Imo State: This comprises of the nine local governments in Imo State that represent the eastern part of the State. They are; Aboh Mbasie, Ahiazu Mbaise, Ezinihitte Mbaise, Ikeduru, Mbaitoli, Ngor Okpala, Owerri Municipal, Owerri North and Owerri West LGAs

Medical Waste Generation: This is a process of medical waste production by either health care facilities, other related services or health research centers etc

(Marco Dettori, 2023).

Medical Waste Collection: This is the gathering of medical waste in appropriate receptacles /bins which are eventually emptied into larger ones before treatment and final disposal can be done. It involves using different containers from various sources of medical wastes. This process usually involves segregation.

Medical Waste Storage: This comes immediately after collection. It simply means keeping medical wastes in larger receptacles or purpose built facilities which have to

meet the requirements stipulated by ICRC, 201l. Waste labelling and segregation should be maintained during storage.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Review

Medical waste is a broad term that includes all the waste generated during the process of health care delivery. It can be within health-care facilities, dental clinics, home/private care units, laboratories and research centres related to medical procedures (WH0, 2014). About 75% to 90% of the waste produced in health facilities are considered as “non-hazardous” because they're generated from normal housekeeping functions of facilities, whereas the remaining 10-25% of health care waste are considered “hazardous” and may pose a significant infection risk to the environment and staff (WHO, 2014).

2.1.1 Sources of Medical Waste

According to Chuks *et al.*, 2013, sources of medical wastes includes; hospitals and health care centers, outpatient clinics and pharmacies, blood banks, collection centers, nursing homes, autopsy centers and mortuaries.

2.1.2 Categories of Health-care Waste

According to WHO guidelines, medical waste is categorized into;

Sharps Waste

This includes all needles, scapples, knives, blades, broken glasses, pipettes etc. These are capable of causing cuts, and puncture and should be treated with great care because they could potentially be harzadous. (WHO, 2014).

Infectious Waste

In this group is all contaminated waste and other wastes suspected to contain pathogens capable of transmitting diseases. Sources here include blood, bodily fluids, animal waste, waste from autopsies, laboratory stocks or contaminated dressing and personal protective materials used in the treatment of patients (WHO, 2004).

Pathological Waste

This is a subset of infectious waste that often stands on its own. Pathological waste includes all human and animal body tissues, parts and fluids whether considered infectious or not (WHO, 2014).

Pharmaceutical waste and Genotoxic waste

Pharmaceutical waste includes all discarded, expired, unused, spilt and contaminated products, creams, drugs, vaccines and sera etc.

Genotoxic waste is a group of wastes that have either mutagenic, teratogenic or carcinogenic properties and should therefore be handled and disposed with great caution because of the dangers they pose to man and the environment (WHO, 2014)

Chemical Waste

Chemical wastes include all discarded chemicals used in diagnostic, experimental, cleaning and disinfecting processes which could either be in solid, liquid and gaseous forms. A chemical is considered infectious if it is toxic, corrosive, flammable, reactive, and oxidizing. Examples are aldehydes, wastes with alcohol and heavy metal content, batteries and thermometers, halogenated and nonhalogenated disinfectants (Senjen & Illuminato, 2009).

Radioactive Waste

These are wastes contaminated with radionuclides produced as a result of in vivo and invitro analytical practices in health care facilities (WHO, 2014).

Non-hazardous General Waste

These are waste items that have not met infectious or hazardous agents and do not pose a puncture threat. About 85% of medical wastes fall into this category and is generated as a result of all household and office activities of a health facility

(WHO, 2014).

2.1.3 Hazards Associated with Healthcare Waste

Health care waste is considered hazardous if it contains sharps capable of causing puncture injuries and subsequent related diseases, infectious and pathogenic agents, genotoxic or harmful chemicals and radioactive materials (Padmanabhan & Debabrata 2019)

2.1.4 Medical Waste Management Practices

Segregation Systems and Colour Codes

Segregation simply means sorting of medical waste into different categories to enable effective health-care waste management practices. This process helps to reduce the volume of hazardous waste as it becomes easier to assess the waste composition (Aseweh, 2013).

Medical waste segregation is best done at the point of generation and by the health worker actively generating the waste. This therefore means that the health care facility management is responsible for making sure that health care workers follow all procedures of segregation and medical waste management (WHO, 2014)

According to WHO guidelines, simple and safe method of medical waste segregation involves the separation of all wastes into two groups: non-hazardous and hazardous wastes and then further separating the hazardous group into sharps and potentially infectious wastes, (this process is called the three- bin system.

Waste segregation system is best practiced using colour coded bags/receptacles as prescribed by the national legislation of a country or by the World Health Organization (Ali *et al*,2017). This makes it easier for medical workers to place waste items into the appropriate bins/receptacles thereby ensuring segregation, and safety of both staff, patients and the environment during handling, transport, treatment and final disposal which are other essential steps in the medical waste management practices (WHO, 2014).

Colour coded receptacles help convey immediately the potential risk/consequences of the content of ant waste receptacle. It's very important to maintain clarity and precision during the placement of these receptacles in different areas of a health care facility. This is to avoid any confusion that may arise from misplacement and its consequent risks on patients, medical staff, other individuals and the environment at large

Table 2.1: Coding recommendations (WHO – UNEP/SBC 2005)

S/N	Type of Waste	Colour Coding - Symbol	Type of Container

1	Household refuse	Black	Plastic bag
2a.	Sharps	Yellow	Sharps container
2b.	Waste entailing risk of contamination	Yellow	Plastic bag or container
2c.	Anatomical waste	Yellow marked "highly infectious"	Plastic bag or container which can be autoclaved
3	Chemical and pharmaceutical waste	Brown, marked with a suitable symbol	Plastic bag, container

2.1.5 Collection and storage within the Healthcare Facility

Waste should be collected at least once a day and routinely. Waste bags/ receptacles should be marked and labelled appropriately to reflect the place of origin. Where possilble, waste should be weighed before disposal. Waste bags/ containers should not be more than three quarters full before disposal. Replacement bags/ containers must always be available before disposal of used ones. Also, infectious/hazardous wastes should not be collected in same receptacles as noninfectious or general waste (WHO, 2014)

According to ICRC (2011), specific area must be designated for storing medical waste and must meet the following criteria; It must be closed but well ventilated and lit, have restricted access, must be far from food store, must be covered from the sun, must have good drainage system on the floor, must be free from rodents, well compartmentalized for easy sorting etc.

2.1.6 Public Health Impacts of Improperly Disposed Medical Wastes. Impacts of health-care wastes are usually felt because of improper handling and disposal of medical wastes. These impacts are mostly in the form of environmental or health impacts.

Environmental impacts are felt in many forms including; poisoning and pollution of the air, land and water bodies through contaminated wastewater from health care facilities, discharged body fluids, and chemicals disposed into the drains. Other ways like heavy metal contamination of land, release of bacteria resistant to antibiotics and chemical disinfectants (Guardabassi *et al.*, 1998). The release of dioxins, furans and other poisonous gases also leads to serious air/environmental pollution.

Health impacts are felt when disease pathogens enter the body through cuts and punctures from sharps etc. These can cause infections such as HIV, Hepatitis B and C (Prüss-Ustunet *et al.*, 2005). Infections from contaminated body tissues and fluids as urine, feaces, vomits etc. Vomits can transmit gastroenteric infections through gastroenteric bacteria like salmonella and shigella spp. This also happens when humans come in contact with toxic chemicals, radionuclides, genotoxic and carcinogenic substances (Padmanabhan & Debabrata, 2019).

2.2. Empirical Studies

Ogbonna, Chindah and Ubani (2012) examined the waste management options for health care wastes in Nigeria: A case study of Port Harcourt hospitals. Five hospitals in Port Harcourt metropolis were randomly selected as representatives of the health care institutions in the area. The selected hospitals were carefully chosen to ensure geographical spread. The instrument used for data collection was questionnaire and direct observation. Data were analyzed using the statistical method of calculating percentages and was tested using analysis of variance (ANOVA). Tables, graphs and other non-parametric descriptive tools were equally used in interpreting the data. The study identified disposal methods of hazardous waste in the healthcare institutions as dumping and open burning and also inadequate relevant training of waste handlers on disposal practices. It also identified inadequate equipment as a problem militating against proper waste management practice in healthcare institutions in Port Harcourt. The study recommended staff training on medical wastes management as a means to reduce its dangers. Waste segregation therefore, should be employed as a critical step to achieve waste minimization, cost reduction and sustainable waste management

practice.

Kumar *et al,* (2010) assessed the health care waste management practices and knowledge among health care workers working at Tertiary care setting of Pakistan. This was a cross sectional study conducted at the Holy Family Hospital Rawalpindi. The sampling method used was the random sampling of 10% from each of the three

(3) categories of health staff for their equal representation comprising 490 doctors, 370 nurses and 112 paramedics including health workers responsible for waste handling or management. Instrument for data collection was the WHO validated, structured questionnaire, checklist and direct observations were adopted. Data was tested using frequencies and percentages. It was analyzed through SPSS version 17 software. The study found out that the knowledge and practices of doctors was higher than the nursing staffs which was in turn higher than the waste handlers (paramedics). The study recommended staff refresher training of the paramedical staff and then continuous supervision of their waste management activities.

Joshua *et al.*, (2014) investigated Healthcare waste management as a potential hazard in selected Primary Health centers in Zaria, Nigeria. It was a cross sectional descriptive study carried out between October 2012 and March 2013. The study assessed the knowledge and practices of staff of the selected PHC's in Zaria associated with hospital waste management as a potential hazard. Multi-staged sampling technique was employed within the 24 wards in Zaria, and a total of 10 PHC's were randomly selected. Selection of the respondents was done via random sampling with the list of health care providers in the selected facilities as sampling frame. The study population was the 100 staff of the 10 selected PHC's that willingly participated in the study. The instruments for data collection were questionnaire, interviews checklists and participant's observation. Data was collected and

presented in tables and charts and was analysed using SPSS erosion 17 software. Findings showed that about half of the respondents were aware of the existence of healthcare waste management policy. It also discovered that though there is healthcare waste management policy, many of the healthcare workers were not aware of it while others just neglected it. The researchers therefore recommended adequate training and re-training of hospital staff on safe waste management and disposal practices, modern facilities for transportation of hospital waste example trolleys and provision of personal protective equipment by the ministry of health for use by the personnel in the PHC's

Obekpa and Ige (2011) carried out research to determine as a case study, Healthcare waste management in Nigeria. The study was carried out between June and September 2008 at a tertiary healthcare facility in Nigeria. It was a cross sectional description design aimed at assessing the current practices and commitment to sustainable HCW management in a tertiary healthcare facility. The study approach involved the estimation of the quantity of HCW generated, evaluation of the waste segregation practices and determination of the knowledge and practice of healthcare workers regarding HCW management. A total of 52 healthcare personnel of the hospital were randomly selected for the research, the instruments used for data collection were questionnaires, and interview sessions. The overall performance rating was then assigned using the Sapproach outlined in the guidelines suggested by

Townend and Cheeseman (2005). The findings of the research showed that current management practices for healthcare wastes generated at the health facility studies is unsustainable and cannot be relied upon to protect human health and environmental integrity because there is no existing policy or plan and no systems in place for sustainable management of healthcare waste. It also found out that there was lack of management commitment, poor waste handling practices, inadequate training on HCW, non-existent segregation of HCW and risky disposal practices. The researchers, therefore, recommended that there should be management commitment to the sustainable management of HCW, also formulation of appropriate institutional and national policies on HCW and initiating monitoring activities relating to HCW in Nigeria.

Nwakwuo *et al*., (2014) examined Hospital waste generation and management practices in Owerri, Nigeria. This was a study aimed to estimate the rate of waste generations and describe the waste disposal management practices. The study surveyed the waste generation and management practice of 12 hospitals and clinics selected using multistage sampling techniques from the list of hospitals in Owerri

Municipal. This study employed a cross-sectional design and was conducted within an interval of two months in 2009 using questionnaire vis-a vis physical observation. Findings revealed that waste was collected mostly three times daily in the surveyed hospitals and the average generation rate is 0.58kg/bed/day, also 16% portion of the waste was hazardous. Disposal methods were generally poor with a greater percentage (50%), of total wastes and sharps 41.7%, disposed into municipal waste stream. The

study thereby recommended among others, training of hospital personnel of the potential risk of hospital waste, workable incinerators should be provided by hospitals, waste segregation from cradle to grave amongst hospitals.

Awodele, Adewoye and Oparah (2016) assessed medical waste management in seven hospitals in Lagos, Nigeria. The study assessed the medical waste management practices in selected hospitals and determined the impact of Lagos waste Management Authority (LAWMA) intervention programs. Two public hospitals and five private ones provide services for low-, middle- and high-income earners. The target population for the survey consisted of 120 personnel selected

(Doctors, nurses, laboratory scientists from both private and public hospitals in Lagos. The study employed an observational cross-sectional design conducted in Surulere, Mushiro/Yaba, Ikeja, Gbagada and Lagos Island areas of Lagos state. It used stratified simple random and convenience sampling methods. The hospitals were stratified into private and public based on the ownership of the hospitals. This was to ensure that various categories of the hospitals operating in Lagos were included in the study. Data were collected using three instruments (questionnaire, site visitation and in-depth interview) and analysed using SPSS version 20. Chisquare statistical test of significance was used to determine the level of significance of association between variables at 95% confidence level. Results of the analysis showed that there was a significant association ($p<0.05$) between the profession of the respondents and the categorization of non-infections waste/domestic waste.

However, there were no significant difference between socio-demographic variables and categorization of infections waste. Also, there was no significant association between socio-demographic variables and waste segregation. There was also a statistically significant association between the profession of the respondents and the ability to identify the colour coding for pathological wastes with highest association amongst the nurses. The study generally observed that the awareness level and training among the workers has relatively increased due to the intervention of Lagos waste management authority (LAWMA) but it still advocated continuous training of the hospital staff on medical waste management. It also recommended the need for awareness on waste management system amongst the patient/community in order to prevent nosocomial infections and environmental hazards. Policies and regulation guidelines should be provided to all the three tiers of government to improve waste management practices throughout the country.

2.3 Summary of Literature Review

This chapter reviewed literature under the following subheadings: conceptual framework, theoretical framework and review of empirical studies.

At the conceptual framework, certain concepts such as medical waste, medical waste management, categories of healthcare wastes, sources of medical wastes, types of hazards associated with healthcare/medical wastes, the waste management hierarchy,

medical waste segregation, storage and transport, treatment methods, final disposed methods and public health impacts of medical wastes were extensively reviewed.

The empirical studies reviewed related research works. These include studies like; Healthcare waste management in Nigeria, Healthcare waste management as a potential hazard in selected Primary Health Centers in Zaria, Nigeria, Medical waste management in Lagos Metropolis Nigeria, Waste management options for healthcare wastes in Nigeria: A case study Port Harcourt hospitals, Healthcare waste management practices in Enugu Metropolis, Nigeria, Health care wastes management practices and knowledge among health care workers working at tertiary care setting of Pakistan, Hospital waste generation and Management practices in Owerri, Nigeria and Medical Waste Management in seven Hospitals in Lagos, Nigeria. However, none of these works emphasized medical waste generation, collection and storage practices among Primary Health Centers in Owerri Zone, Imo State, thereby creating a gap which the current study aims at

filling.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Research Design

In this study, a descriptive cross-sectional design was used. It is a design used to compare many variables among different population groups at a single point in time. The Purpose of using this design is to examine medical waste generation, collection and storage practices among Primary Health Centres in Owerri Zone, Imo State and this is also in line with a similar study carried out by Obekpa & Ige (2011).

3.2 Area of the Study

According to findings from Abdul of Aziza Goodnews 2019, Owerri senatorial Zone of Imo State, Nigeria is the name given to Imo East senatorial district. It is made up of nine (9) Local government areas namely: Aboh Mbasie, Ahiazu

Mbaise, Ezinihitte Mbaise, Ikeduru, Mbaitoli, Ngor Okpala, Owerri Municipal, Owerri North and Owerri West. The area under study has both public and privately owned Primary Health centers which range in size from small, medium health care facilities. The Primary Health Centres are also located in both the Urban and rural areas of the senatorial Zone. The inhabitants of the Zone are mostly farmers, craftsmen, teachers, traders with high level of commercial and business involvement and educational professionals in different fields of study.

Map of Imo State highlighting the local governments that make up Owerri Zone.

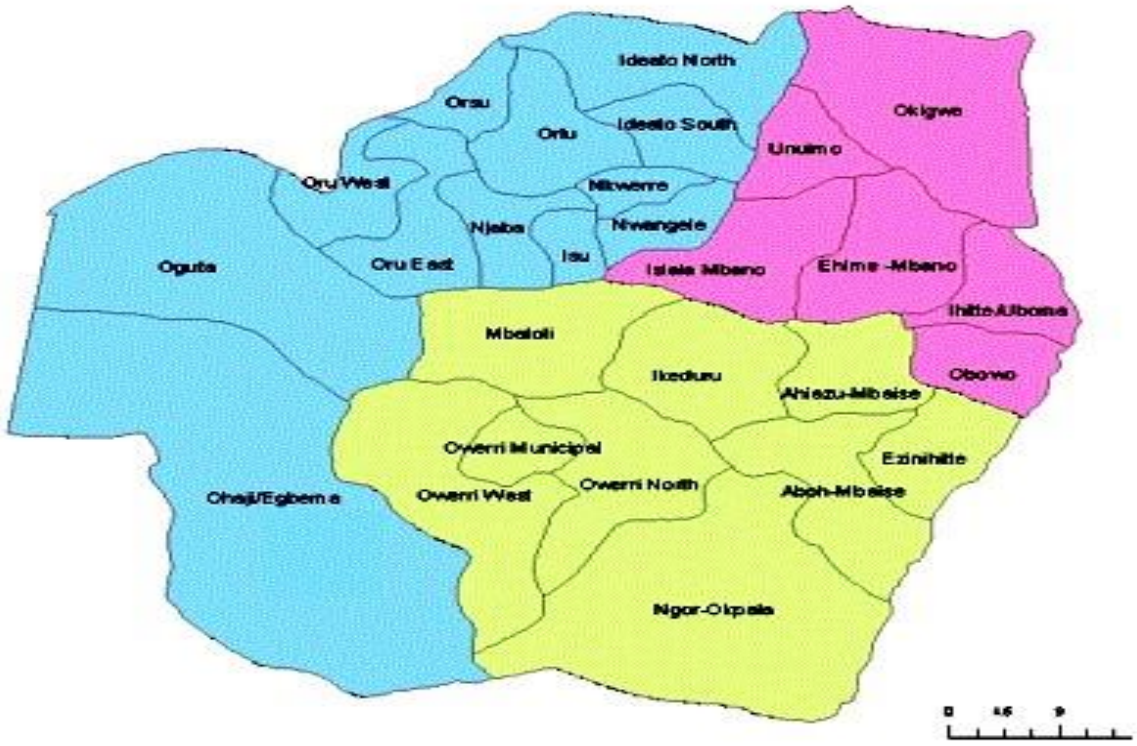

Figure 3.1: The area in yellow background represents Owerri Zone

Adapted from Nigeria Galleria ©2017.

3.3 Study Population

The population of this study is made up of the 302 Primary Health Centres in Owerri Senatorial Zone, Imo State. 138 are Public Primary Health Centres and 164 are Private Primary Health Centre. (See Appendix D for summary of total number of Primary health centers in Owerri Zone. Source, Imo State Health Facility listing, 2018)

3.4 Sample Size and Sampling Methods

3.4.1 Sample Size

The sample size is made up of 38 Primary Health Centres (17 Public and 21 Private).

This number was determined by using the multi state sampling method. It is a process of moving from a broad to narrow sample (Ackoff, 1953). This is achieved by sampling all the nine (9) local governments in Owerri zone and a 1/3rd of them are chosen using simple random sampling (Taherdoost, 2016) to get three (3) local government areas (Aboh Mbaise, Mbaitoli, and Owerri North Local Government Areas) which is equal and proportionate to the total local government areas in the zone. These three (3) LGA's have altogether, a total of 51 public Primary Health Centers and 65 private Primary Health Centers. (See Appendix E for the list of Primary Health Centers in Aboh Mbaise, Mbaitoli and Owerri North local government areas).

The second stage involves a second random sampling of 1/3rd of total PHC types in each of the local governments originally chosen for both public and private PHC's to give approximately six (5 or 6) public PHC's and seven (7) private PHC's per LGA randomly chosen. (See Appendix F for derivation of sample size). The distribution of questionnaire was in the following proportion; 10 questionnaires

were distributed in each PHC visited to health workers, cleaners or any staff to obtain information about the PHC visited . This made the total number of questionnaires distributed to be 380 (38 * 10 =380).

3.4.2 Sampling Method

The sampling method to used is the multi-stage sampling method (Ackoff, 1953).

STEP ONE: All the 9 local governments that make up Owerri zone are sampled and 1/3rd of them are randomly chosen to give three (3) LGA's – this is to get a number equal and proportionate to the study population..

1/3 *9 = 3

The 3 LGAs randomly chosen are Aboh Mbaise, Mbaitoli and Owerri North LGA's.

STEP TWO: A second random sampling of the entire PHC's in Aboh Mbaise, Mbaitoli and Owerri North LGA's was done and 1/3rd of each group was randomly selected. The three Local governments altogether have 116 PHCs.

Aboh Mbaise has 34 PHCs (14 are public owned and 20 are Private owned)

Mbaitoli LGA has 48 PHCs (17 are Public owned and 31 are Private owned)

Owerri North LGA has 34 PHCs (20 are Public owned and 14 Private owned) Total number of **Public PHCs in the 3 local governments are 51** while the total number of **Private PHCs are 65.**

1/3 * 51 = **17 (Public PHC's)**

1/3 * 65 = **21 (Private PHC's)**

17+ 21 = 38 PHCs . (See Appendix F for derivation of sample size)

3.5 Instruments for Data Collection

The instrument for data collection is questionnaire in addition to observation checklist.

Copies of the Questionnaire, (adapted from WHO, 2005) of about five(5) sections each was issued to any staff present and willing to participate particularly nurses and waste handlers to obtain information on the following on the health care facility regarding their; policy of PHC on medical waste management, types of medical waste generated, treatment, and final disposal practices. Photographs and notes on Physical observations was taken by the researcher to confirm responses in the questionnaire.

3.6 Validity of Instruments

The research questionnaire was carefully prepared by the researcher and presented for validation to the researcher's supervisor.

Face validity of the study questionnaire was ensured by the supervisor after carefully going through it and making corrections which the researcher effected before its approval (see attached copy of the study questionnaire in Appendix A) Content validity of the study questionnaire was ensured by the researcher and the supervisor as the materials used in preparing the questionnaire were adapted from a check list prepared by the WHO (2005) on safe health care waste management. The content of the questionnaire was designed to cover effectively, all areas of interest to the objectives of the study.

3.7 Reliability of the Instrument

Test-retest method was used to test the reliability of the questionnaire. A total of 16 copies of the study questionnaire was initially administered to four (4) primary health centres in Orlu local government of Orlu Zone (2 public owned and 2 private owned). Each Primary Health centre will receive four (4) questionnaires (2 for the nurses and 2 for the waste handlers). This is so because it is a similar study population. The process was repeated one week later and the results was scaled and compared for consistency test via Crombach Alpha test and a reliability coefficient of 0.8 was gotten

3.8 Method of Data Collection

Copies of the study questionnaire was administered to the respondents by the researcher after an informed consent was obtained and on the spot collection was made in order to ensure maximum return. For respondents who were not be able to read effectively, the researcher assisted them by filling their responses in the questionnaire. The rating scale on the questionnaires was used for the analysis. Also, photographs and notes on physical observations made on site were taken by the researcher while still present in any chosen primary health center.

3.9 Method of Data Analysis

Generally, data was analyzed using the software package IBM-SPSS Version 21.

Hypotheses 1-3 will be tested using chi-square test at 5% level of significance and 95% confidence interval.

The decision rule for all the chi-square tests was based on the pearson chy square value. When p-value is less than 0.05, it shows an association/relationship between the variables tested but p-value of more than 0.05 shows no

relationship/association between the variables tested.

3.10 Ethical Consideration/Informed Consent

The researcher obtained an approval for research from the Federal University of Technology Owerri (FUTO), School of Health Technology Local Ethical Committee before proceeding to any Primary Health Centre. Letters were issued to the managers of all the primary Health Centres where research was to be carried out. Verbal consent was obtained from participants before any questionnaire was given to them or question asked them.

CHAPTER FOUR

RESULTS

4.1.1 Socio-Demographic Data of PHC's in Owerri Zone, Imo State.

The socio-demographic information of the participants was depicted in the table 4.1; majority 155(40.7%) of the respondents were between the age group of 30-40 years, 120(31.6%) were between 18-30 years, 60(15.8%) were between 40-50 years, 40(10.5%) were between 50-60 years and 5(1.3%) fall on 60 years above. Out of 380 respondents; females were higher 205(53.9%) than males 175(46%) and 355(93.4%) were Christians followed by traditional worshipers with 17(4.5%) and only 8(2.1%) were Islam. From the result, 125(32.8%) has 6 -12 years work experience, 100(26.3%) has 1- 6 years work experience and the least was 4(1%) with above 18

years. Professional qualification of the respondents; 121(31.8%) were junior community health officer, 104(27.4%) were nurse, 77(20.2%) were senior community health officer, 34(8.9%) were Lab. Technician, 29(7.6%) were Environmental health officer, and 15(3.9%) were doctors. Location of Primary health center; 156(41.1%) reported Semi-rural, 145(38.2%) reported rural,

57(15%) said urban and 22(5.7%) said semi-urban.

Table 4.1: Socio Demographic Data

	Frequency (n =380)	Percentage
Age bracket of the respondent		
18 – 30 years	120	31.6
30 – 40 years	155	40.8
40 -50 years	60	15.8
50-60 years	40	10.5
above 60 years	5	1.3
Total		100.0
Sex of the respondent		
Male	175	46.1
Female	205	53.9
Total		100.0
Religion of the respondent		
Christian	355	93.4
Islam	8	2.1
Traditional	17	4.5
Total		100.0
Years of work experience of the respondent		
Less than one year	56	14.7
1- 6years	100	26.3

6 -12 years	125	32.9
12 -18 years	95	25.0
Above 18 years	4	1.1
Total		100.0
Professional qualification of the respondent		
Nurse	104	27.4
Lab. Technician	34	8.9
Doctor	15	4.0
Junior community health officer	121	31.8
Senior community health officer	77	20.3
Environmental health officer	29	7.6
Total		100.0
Location of Primary health center		
Rural	145	38.2
Semi-rural	156	41.1
Urban	57	15.0
Semi- urban	22	5.7
Total		100.0

4.1.2 Types of Primary Healthcare Facility

Figure 4.1 shows the types of primary health care facilities recorded in this study includes; 175 (46%) of the respondents are from public primary health care facilities while 205 (54%) are from private primary health care facility.

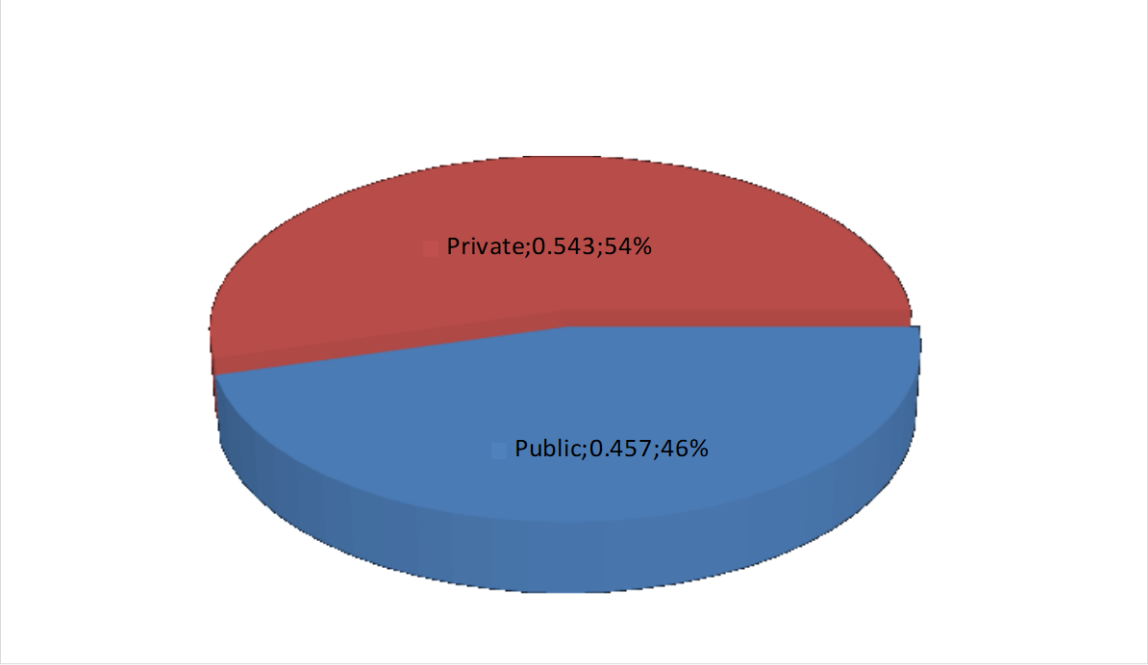

Figure 4.1: Type of primary health care facility.

4.1.3 Type of wastes generated within the healthcare facility

The type of waste generated within the healthcare facility was common in general waste (45%), followed by infectious waste (23%), sharp waste was 15%, radioactive waste and pharmaceutical waste had equal percentage (5%), while anatomic and chemical wastes had 4% and 3% respectively. (Figure2).

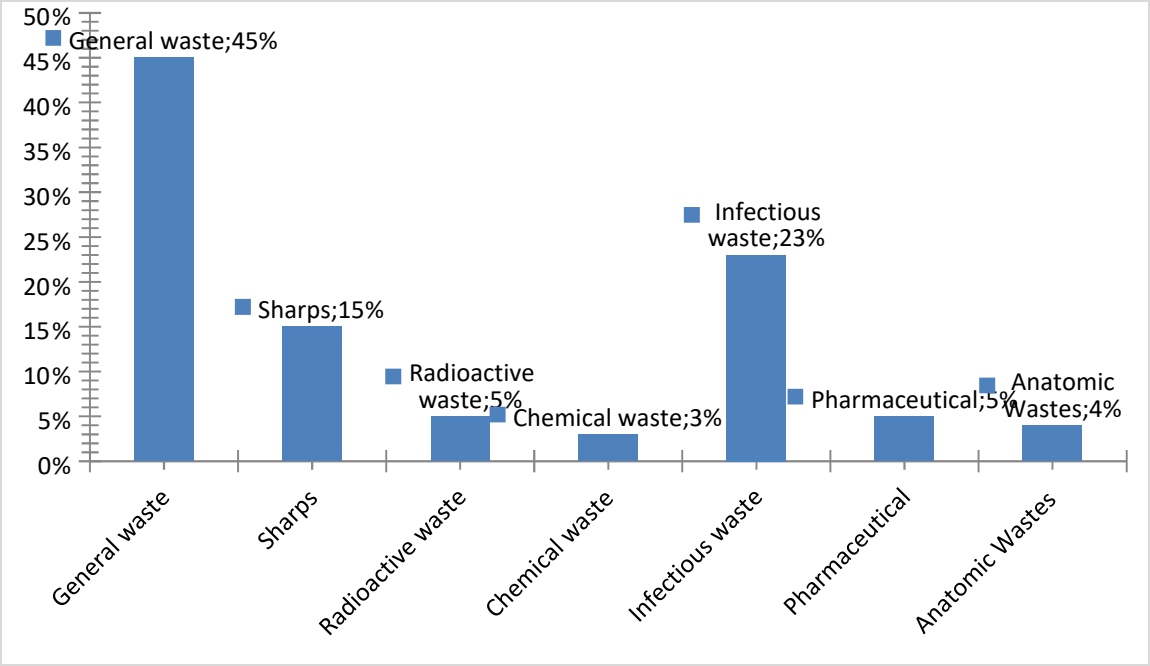

Figure 4.2: Type of wastes generated within the healthcare facilities

4.1.4 Type of syringes used within the health facilities

The types of syringes used within the facilities were mostly disposable syringes 61%, sterilizable syringes 23%, auto-disable syringes 13% and safety syringes 4% (Figure 4.3).

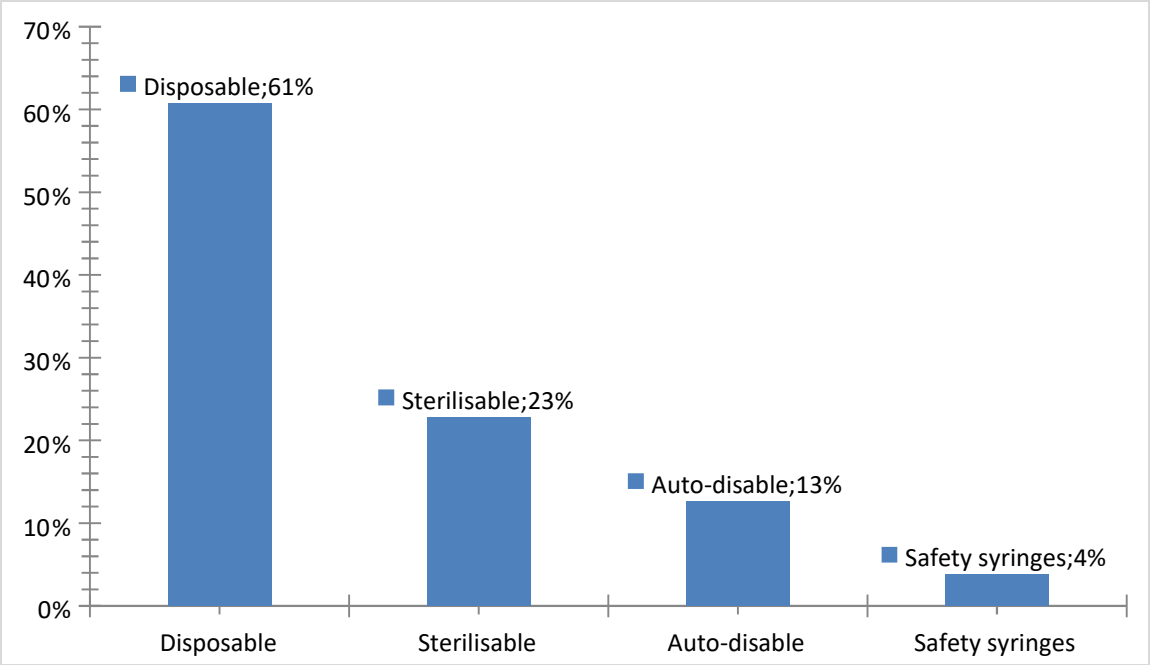

Figure 4.3: Types of syringes used within health care facilities

4.1.5 Capacity of Primary Health Centers and Waste Generation

Table 4.2 presents a summary of the health care facility size/traffic and the effective accruing waste generated. For the number of beds available in the facility, majority 160 (42.1%) reported 1-5 beds, 105(27.6%) reported 6-10 beds, and the least was 45(11.8%) for 16 beds and above. Number of beds currently occupied;

175(46.1%) reported 5-10 beds, 158(41.6%) said to be less than 5 beds and 47(12.4%) stated 11-15 beds. Average bed occupancy in a week; 190 (50%) reported 5-10 beds, 179(47.1%) said less than 5 beds and 11(2.9%) stated 11-15 beds. Number of outpatients that comes in a day; 175 (46.1%) reported 5-10 patients, 158(41.6%) reported less than 5 patients in a day and 47 (12.4%) reported between 11-15 patients. Do you weigh waste in this facility; 156(41%) said yes while 224(58.9%) said no to the question. The quantity of waste generated in a day in kg; 150 persons (39.5%) said 5-10 kg followed by 1-5kg with 134 persons

(35.3%), 79 persons (20.8%) said 10-15kg and the least was 5 persons (1.2%) for 20kg above.

Table 4.2: Capacity of Primary Health Centers and Waste Generation

Variable	Frequency n=380	Percentage (%)
Number of beds available in this facility		
1-5 beds	160	42.1
6-10 beds	105	27.6
11-15 beds	70	18.4
16 beds and above	45	11.8
Total		100.0
Number of beds currently occupied		
<5	158	41.6
5-10	175	46.1
11-15	47	12.4
Total		100.0
Average bed occupancy in a week		
<5	179	47.1
5-10	190	50.0
11-15	11	2.9
Total		0.0
Number of outpatients that comes in a day		
<5	158	41.6
5-10	175	46.1
11-15	47	12.4
Total		100.0
Weigh waste in this facility		
Yes	156	41.1
No	224	58.9
Total		100.0
Quantity of waste generated in a day in kg		
1-5kg	134	35.3
5-10kg	150	39.5
10-15kg	79	20.8
15-20kg	12	3.2
20kg and above	5	1.2
Total		100.0

4.1.6 Relationship between the location of Primary Health Centers and the Types of Wastes Generated.

Out of the 380 respondents for the location of PHC's in table 1; 145 said rural, 156 reported semi-rural, 57 reported urban and 22 reported semi- urban.

Following the result from fig 2 which showed that 45% (171) reported general waste, 15% (57) reported sharps, 5% (19) reported radioactive waste, 3% (11) reported chemical waste and 23% (87) reported infectious waste, 5% (19) reported pharmaceutical waste and 4% (15) reported anatomic waste.

Table 3 however, shows the relationship between the location of Primary health centers and the type of medical waste generated; majority (171) of them reported general waste found mostly in rural areas. Pearson Chi-Square (X^2) test showed significant relationship between location of primary health centers and type of medical waste generate ($X^2 = 808.192$; df = 21 at P-value <0.05).

	General waste	145 0	26	0	0	171
	Sharp	0	57	0	0	57
	Infectious waste	0	73	14	0	87
	Anatomic waste	0	0	15	0	15
	Radioactive waste	0	0	19	0	19
Type of medical waste generated	Pharmaceutical waste		0	9	10	19
	Chemical waste	0	0	0	11	11
		0	0	0	1	1
Total		145	156	57	22	380

Pearson Chi-Square ***808.192; Df = 21; P-v <0.05***

Table 4.3: Location of Primary health centers and Type of medical waste generated

Type of medical waste generated	**Location of Primary health center**					
	Rural	**Semi-urban**	**Urban**	**Semi-**	Total	**rural**

4.1.7 Waste Collection Practices

Table 4.4 presents the waste collection; Plan for waste collection within the facility, 167(43.9%) said yes there is plan for waste collection within health care facility while 213(56.1%) said no to the idea. The number of times waste is collected in a day; 145(38.2%) reported once, 123(32.4%) reported, when necessary, 49(12.8%) said twice and only 10(2.6%) said three times. Are the receptacles or waste bins within facility with lids? 175(46.1%) said yes while 205(53.9%) said no. Are there are adequate numbers of receptacles for waste collection, 156(41.5%) said yes while 224(48.4%) said no. Reasons responsible for inadequacy of receptacle/bin shortages; 146(38.4%) reported insufficient funds,

130(34.2%) said poor budgeting and the least was 11(2.8%) for others.

Table 4.4: Waste Collection Practices

Variable	Frequency	Percentage	
Plan for waste collection within the health care facility			
Yes	167		43.9
No	213		56.1
Total			100
Number of times is waste collected in a day			
None	53		13.9
When Necessary	123		32.4
One	145		38.2
Two	49		12.8
Three	10	2.6	
Receptacles or waste bins within the facility with lids			
Yes	175	46.1	
No	205	53.9	
Total		100.0	
Adequate numbers of receptacles for waste collection			
Yes	156	41.1	
No	224	58.9	
Total		100.0	
Reasons that are responsible for inadequacy of receptacle/bin shortages			
Poor budgeting	130	34.2	
Insufficient Funds	146	38.4	
Theft	75	19.7	
Logistical	18	4.7	
Others	11	2.8	
Total		100.0	

4.1.8 Knowledge of Healthcare Workers on Medical Waste Collection Plan and other Practices

To explain Table 4.5, table 4.11 showed that 65 out of 380 respondents said yes to knowledge of signs, symbols and other displays that help with proper waste handling with the health facilities while 315 said no. Also, response from table 4.4 showed that 167 said yes to waste collection plan within the health care facility while 213 said no to the question.

Now, table 4.5 compares the association between the knowledge of health care workers on medical waste collection practice within the primary health care facilities. Pearson Chi-Square (X^2) test showed significant relationship between knowledge of health workers on symbols, signs or well written displays on methods of proper waste collection, and other practices within the primary health care centers and waste collection plan ($X^2 = 100.011$; df = 1 at P-value <0.05).

Table 4.5: Knowledge of health workers (symbols, signs or well written displays) and medical waste collection and other practices within the primary health care centers

Plan for waste collection within the health care facility			Total
	Yes	No	
Knowledge of health workers on symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres	Yes	65	0	65
	No	102	213	315
Total		167	213	380
Pearson Chi-Square		***100.011; Df = 1; P-v <0.05***		

4.1.9 Type of container/bags used to collect waste

Table 4.6 presents the type of container/bags used to collect waste; majority 130(34%) use cardboard boxes for waste collection and least 40(10.5%) used metal container in general waste collection. For sharps, the largest number 177(47%) reported none, 140(36.8%) of the participants use metal containers and the least 63(16.6%) reported plastic containers for collection of sharp objects. For pathological wastes, majority 234(62%) did not apply any method while 23(6.1%) reported the use of plastic containers. For radioactive wastes, the largest 340(89%) reported none while 11(3%) reported metal containers. Out of the 380 participants , 281(74%) being the largest reported none, 33(9%) being the smallest reported lead boxes as containers for disposing chemical wastes. For infectious wastes, 147(39%) reported none and 103(27%) reported the use of plastic containers. For pharmaceutical wastes, 126(33%) reported waste bags while 194(51%) reported none.

Table 4.6: Type of container/bags used in waste collection

Types of Waste	**Cardboard bag**	**Plastic boxes**	**Metal container**	**Lead container**	**N/A boxes**	**Total**	
General waste	125(33%)	130(34%)	75(19.7%)	40(10.5%)	0(0%)	50(13%)	380
Sharps	0(0%)	0(%)	63(16.6%)	140(36.8%)	0(0%)	177(47%)	380
Pathological waste	0(0%)	0(0%)	23(6.1%)	123(32%)	0(0%)	234(62%)	380
Radioactive waste	0(0%)	0(0%)	0(0%)	11(3%)	29(8%)	340(89%)	380
Chemical waste	0(0%)	0(0%)	0(0%)	66(4.1%)	33(9%)	281(74%)	380
Infectious waste	31(8%)	0(0%)	103(27%)	99(26%)	0(0%)	147 (74%)	380
Pharmaceutical waste	126(33%)	0(0%)	45(12%)	15(4%)	0(0%)	194(51%)	380
Pressurized container	0(0%)	0(0%)	0(0%)	29(8%)	14(4%)	337(88%)	380

4.1.10 Knowledge of Colour Coding/ Segregation of Waste Table 4.7 showed the knowledge of colour coding/segregation of waste; out of all the respondents, 171 (45%) segregate their waste while 209 (55%) do not segregate waste. Into what categories are waste segregated; Out of 380, 135(35.5%) said colour codes, 134(35.3%) said Infectious wastes, 87(22.8%) said sharps and only 24(6.3%) said radioactive wastes. Do you use colour coded waste containers/bags for segregation in the facility; out of 380 respondents, 171(45%) said yes and 209(55%) said no to the idea. At what point in the waste stream is waste segregated in the facility; majority 121(31.8%) said no segregation,

75(19.7%) said at point of generation and 47(12.3%) said at storage and only 7(1.8%) said collection. Among the respondents, 135(35.5%) said yes, medical waste is regulated/controlled in their facilities while 245(64.5%) said no. As regards who is responsible for medical waste regulation, 104(27.3%) said lab technicians, 45(11.8%) said nurses, 183 (48.2%) said environmental health officers, 15(3.9%) said doctors and the least 8(2.1%) cleaners.

Table 4.7: Knowledge of Colour Coding/Segregation of waste.

Variable	Frequency	Percentage	
Segregate waste in this facility			
Yes	171		45.0
No	209		55.0
Total			100.0
Categories for waste segregation			
Colour codes	171		35.5
Sharps	87		22.8
Infectious wastes	134		35.3
Radioactive wastes	24		6.3
Total			100.0
Colour coded waste containers/bags for segregation in the facility			
Yes	171	45	
No	209	55	
Total		100.0	
Point in the waste stream for waste segregation in this facility			
No segregation		121	31.8
At generation		75	19.7
During transport		26	6.8
Storage		47	12.3
Treatment		15	3.9
Final disposal		9	2.3
Collection		7	1.8
From generation to final disposal		80	21.0
Total			100.0
Segregation regulated or controlled in this facility			
Yes	135	35.5	
No	245	64.5	

Total	100.0	
Who is responsible for regulation		
Lab Technician	104	27.3
Nurses	45	11.8
Environmental health officer/ technician	183	48.2
Doctors	15	3.9
Security	25	6.6
Cleaner	8	2.1
Total		100.0

4.1.11 Color codes used for healthcare waste collection/segregation Table 4.8 presents different color codes used for healthcare waste collection/segregation; out of the 171 that reported observance of segregation and colour coding, majority 141(85%) use black for general waste and the least 8(4.6%) used yellow in general waste collection process. For pathological waste, the largest number 129(75%) of the participants use yellow, 23(13%) use black and 19(11%) use brown. For radioactive waste, 122(71%) apply brown receptacles and

31(18%) use black. For chemical waste collection, 134(78%) use brown and 23(13%) use black for collection/segregation. To collect pharmaceutical waste, 133(78%) use black and 23(13%) use yellow. For sharps, 98(57%) use black whereas 41(24%) use brown and 32(19%) use yellow for collection/segregation of sharps wastes.

Table 4.8: Colour code used for health care waste collection/segregation

Types of Waste	Black	Brown	Yellow	Total
General Waste	141(85%)	15(11%)	8(4.6%)	171
Pathological waste	23(13%)	19(11%)	129(75%)	171
Radioactive Waste	31(18%)	122(71%)	18(11%)	171
Chemical Waste	23(13%)	134(78%)	14(8%)	171
Pharmaceutical Waste	133(78%)	15(9%)	23(13%)	171
Sharps Waste	98(57%)	41(24%)	32(19%)	171

4.1.12 Health Care Waste Storage

Table 4.9 depicts health care waste storage; 156(41%) reported that there is a designated/specific areas for health care waste storage while 224(58.9%) said no. Out of the 156 people who said yes, 55(35.2%) said waste is stored behind buildings, 57(36.5%) said open dumping is practiced, 31(19.8) said waste was stored inside waste containers/bags. On the duration of waste storage before disposal, 45(28.8%) said one day 56(35.5%) said 2 day to 3 days, 32(20.5%) said one week and 1 (0.6%) said waste is stored beyond one month before disposal. On the question of if waste storage receptacles within the facility has lids, 97(25.5%) said yes while 283(74.5%) said no. Again, 171(45%) said yes, they segregation was maintained/practiced during

storage within the facility while 209(55%) said segregation was not practiced during storage. Out of 380 participants, 85(22.3%) said there was adequacy of storage containers in this facility while the rest said no.

Table 4.9: Health Care Waste Storage

Variable	Frequency	Percentage	Designated/specific areas for health care waste storage
Yes	156		41.0
No	224		58.9
Total			100.0
If yes, where is it being stored?			
Behind a building	55		35.2
Put inside a waste container/bags	31		19.8
Waste storage room	8		5.1
Open dumping	57		36.5
Any designated place within the health care facility	5		3.2
Total	156		100.0
Period of storing wastes before disposal			
One day	45		28.8
2-3 days	56		35.8
One week	32		20.5

Close to two weeks	12		7.6
One month	10		6.4
Beyond one month	1		0.6
Total	156		100.0
Waste storage receptacles in this facility have lids			
Yes	97		25.5
No	283		74.5
Total	380		100.0
Is segregation maintained/practiced during storage within facility?			
Yes	171	45.0	
No	209	55.0 Total	100.0
Is there adequacy of storage containers in this facility?			
Yes	85	22.3	
No	295	77.6	
Total		100.0	

4.1.13 Relationship between Type of Primary Health Center and where Medical Waste is Stored.

Table 4.10 is a summary/comparison of the information in figure 4.1 and table 4.9. Figure 4.1 shows that there are 175 (46%) public and 205 (54%) private primary health centers respectively. Table 4.9 shows a summary of how/ where medical waste is being stored in the health care facilities visited; 55 of public primary health care centers reported behind a building, 13 of private primary health care centers reported open dumping and Pearson Chi-Square (X^2) test showed significant relationship between the type of primary health care facility and where medical waste is being stored. (X^2 = *261.56*; df = 5 at P-value <0.05).

Table 4.10: Relationship between Type of primary health Center and Where medical waste being stored

Where medical waste being stored	Type of primary health		Total
	Public	Private	
Where medical waste Behind a building	55	0	55

being stored	Put inside a waste container/bags	31	0	31
	Waste storage room	8	0	8
	Open dumping	44	13	57
	Any designated place within the health care facility	0	5	5
	None of above	37	187	224
Total		175	205	380

Pearson Chi-Square	***261.56***
DF	***5***
P-value	***<0.05***

4.1.14 Knowledge of Health Care Workers on Generation, Collection, Storge of Medical Waste and associated risks.

Table 4.11 depicts the knowledge of health care workers on generation, collection, storage of medical waste and associated risks; on symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres 65(17.1%) said yes, while 315(82.8%) said no.

145(38.1%) reported that the staff handling health care wastes don't use any personal protective equipment while 134(35.2%) use handgloves, 43(11.3%) said boots, 34(8.9%) use aprons, while 24(6.3%) for face and nose masks. Concerning awareness of policy on medical waste management within the health care facility, 51(13.4%) said yes while 329(86.6%) said no to the question. On the implementation of the policy, 2(3.9%) said there is a waste management committee to implement the policy. 178(46.8%) said they have knowledge of infectious diseases from poor waste

handling and most of them 194(51%) reported Hepatitis B and C as infectious diseases they knew followed by Tuberculosis with

71(18.6%).

Table 4.11: Knowledge of Health Care Workers on generation, collection and storage of medical waste and associated risks

Variable	Frequency n=380	Percentage (%)	
Knowledge on symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres			
Yes	65	17.1	
No	315	82.9	
Total		100.0	
Personal protective equipment used by staff handling health care waste use			
None		145	38.1
Apron		34	8.9
Hand gloves		134	35.2
Boots		43	11.3
Face and nose masks		24	6.3
Total			100.0
Provision for training of staff regarding health care waste handling			
Yes	78	20.0	
No	304	80.0	
Total		100.0	
Awareness of any policy on medical waste management within the health care facility			
Yes	51	13.[1]	
No	329	86.6	
Total	380	100.0	

[1] **.1.15 Training within the facilities**

If yes, is there any waste management committee to implement the policy		
Yes	2	3.9
No	49	96.1
Total	51	100.0
Have knowledge of infectious diseases from poor waste handling		
Yes	178	46.8
No	202	53.2
Total		100.0
If yes, which ones do you know		
Hepatitis B and C	194	51.0
Tetanus	65	17.1
Cuts	40	10.5
HIV	10	2.6
Tuberculosis	71	18.6
Total		100.0

Of the 380 respondents, 78(20%) said there is provision for training of staff regarding health care waste handling while 304(80%) said no to the question. On the kind of training given within the facilities, 35.8% said training on waste collection, 19.2% said training on waste storage and disposal, and 12.8% said training on health effects of poor medical waste management (Figure 5).

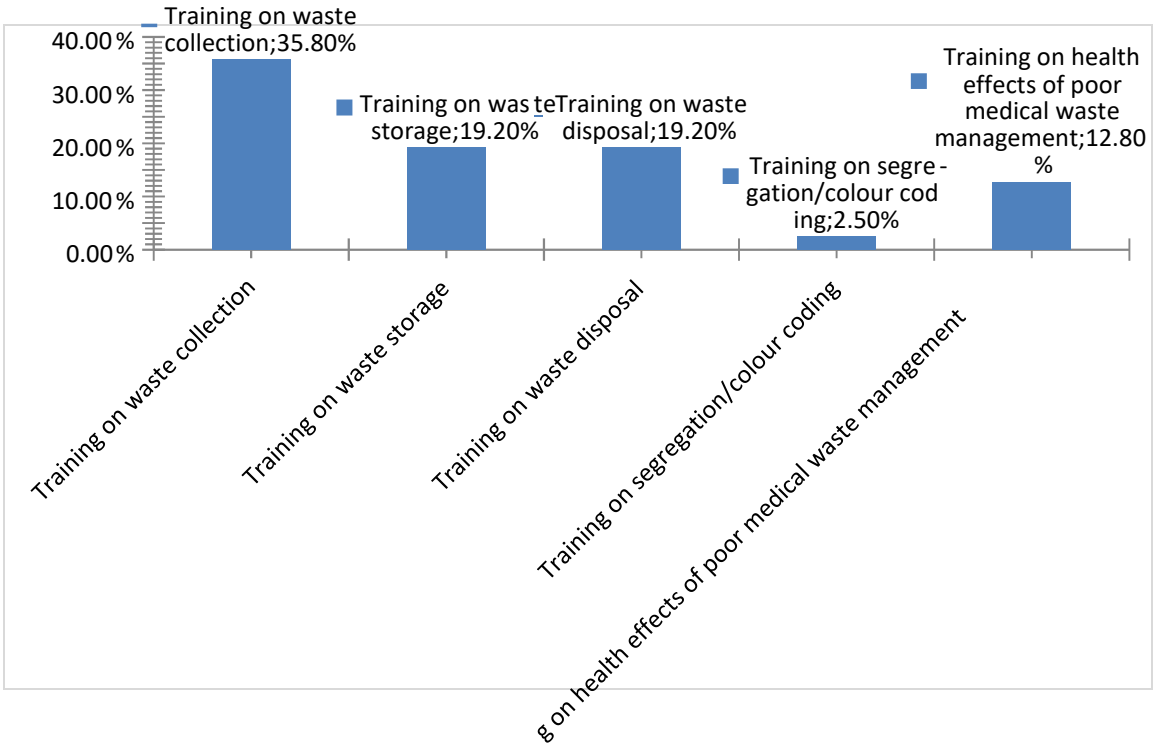

Figure 4.5: Training within the facilities.

4.1.16 Waste Handling Duty

Figure 4.6 presents a graphical representation of whose duty is it to handle waste from generation to final disposal within the facilities, 5.3% said nobody, 3.9% said security, 7.8% said any staff, 39.4% said health care waste handler, 38.2% said Environmental health officer/ Technician and 5.3% said all of the above.

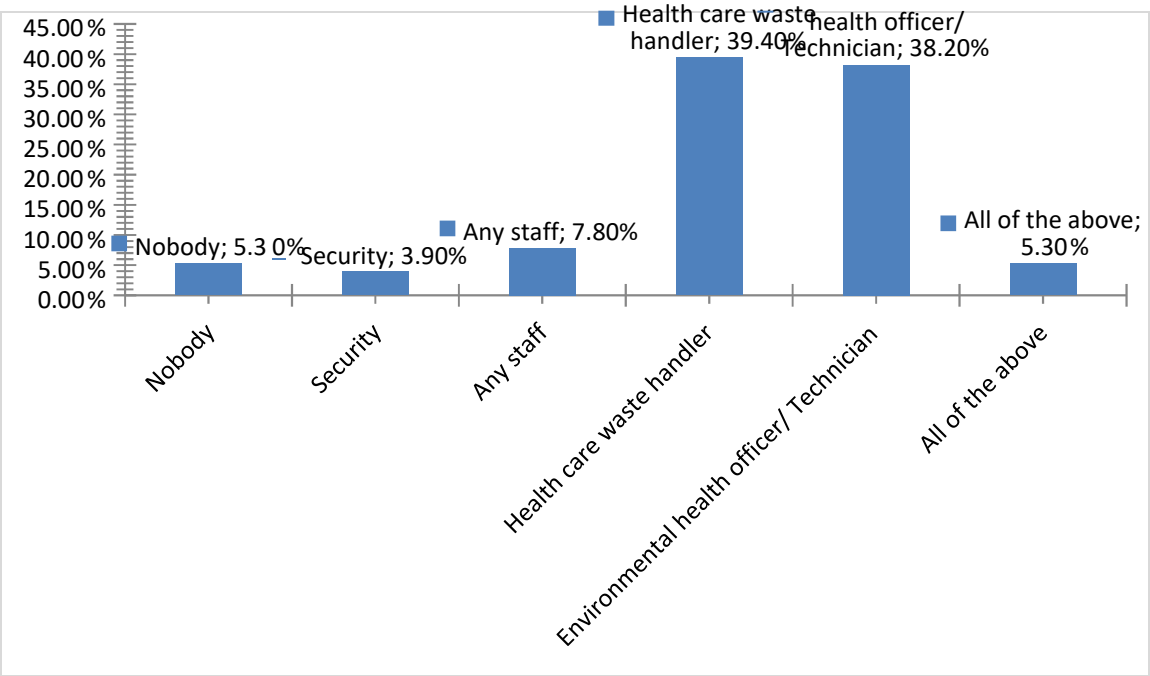

Figure 4.6: Waste handling duty within facilities.

4.1.17 Medical waste Generation, Collection and Storage Practices

Table 4.12 presents the checklist used for Medical Waste Generation, Collection and Storage Practices among Primary Health Centers in Owerri Zone, Imo State; majority stated had no knowledge of waste segregation and proper collection, few of them knew how to effectively store and document waste having in mind SOPs and policy guidelines within the health facilities and there is low reports of training and retraining of related staff concerning possible risks involved.

Table 4.12: Medical Waste Generation, Collection and Storage Practices among Primary Health Centers in Owerri Zone, Imo State

Activities	Response			
	Check Yes or No			
Waste segregation and collection				
Does waste segregation occur at the point where the waste is generated?	Yes	171(45.0%)	No	209(55.0%)
Is the collected waste properly segregated	Yes	171(45.0%)	No	209(55.0%)
Are color-coded waste containers used in all facility areas	Yes	209(55.0%)	No	171(45.0%)
Are waste containers properly marked and labeled as per the waste they contain	Yes	156(41.1%)	No	224(58.9%)
Do all yellow containers for collecting infectious waste have lids	Yes	171(45.0%)	No	209(55.0%)
Are all waste containers free of leaking	Yes	145(38.1%)	No	235(61.9%)
Are sharps containers puncture-resistant, and leak-proof	Yes	145(38.1%)	No	235(61.9%)
Are the waste containers emptied at the end of each day	Yes	160(42.1%)	No	220(57.9%)
Are the waste containers filled no more than about three-quarters full	Yes	130(34.2%)	No	250(65.8%)
Is segregated sharps waste sealed and labeled before transportation	Yes	125(32.9%)	No	255(67.1%)
Is medical waste other than sharps placed in clearly labeled heavyduty biohazard plastic bag or yellow plastic bag	Yes	175(46.1%)	No	205(53.9%)
Does everyone who will be handling waste have the appropriate PPE (Gloves, tongs)	Yes	198(52.1%)	No	182(47.9%)
Waste storage				
Are lids of waste bins and containers closed properly during transportation from ward to central storage	Yes	124(32.6%)	No	256(67.4%)
Is waste storage area located away from the patients	Yes	256(67.4%)	No	124(32.6%)
Are the waste collection tanks completely enclosed	Yes	95(25.0%)	No	285(75.0%)
Are the waste collection tanks not overfilled	Yes	105(27.6%)	No	275(72.4%)
Is waste storage area kept clean, free from loose litter and malodorous spillages and debris	Yes	167(43.9%)	No	213(56.1%)
Is waste storage area free from pests and vermin	Yes	125(32.9%)	No	255(67.1%)
Is waste storage area well lit	Yes	156(41.1%)	No	224(58.9%)
Is water supply available for cleaning purpose in the storage area	Yes	95(25.0%)	No	285(75.0%)
Documentation				
Are policy and procedures for medical waste management available in the storage area	Yes	100(26.3%)	No	280(73.7%)

Are SOPs for waste holding and storage available in the storage area	Yes	70(18.4%)	No	210(81.6%)
Is the record of quantity of collected waste in the storage area well maintained and up-to-date	Yes	160(42.1%)	No	220(57.9%)
Training				
Are storage area personnel training files up-to-date and available	Yes	70(18.4%)	No	210(81.6%)
Is refresher training available to all related staff at least yearly	Yes	50(13.2%)	No	230(86.8%)
Do personnel understand hazards and how to minimize risks	Yes	100(26.3%)	No	280(73.7%)
Is injury and emergency response procedure known and understood by all relevant personnel	Yes	60(15.8%)	No	220(84.2%)

CHAPTER FIVE

DISCUSSION, CHALLENGES, CONCLUSION AND RECOMMENDATIONS

Discussion

The findings on medical waste generation, collection and storage practices among primary health centers in Owerri Zone, Imo State showed that majority of the primary health care staff were junior community health officers and nurses who had mostly between 6-12 years work experience. Many of the facilities visited were semi-rural and rural. This study assessed the Primary health care centers through the personnel in the following management practices; types of health care waste generated, medical waste collection (segregation/colour coding) practice, medical waste storage and knowledge of health care workers on waste handling and risks involved.

Results on medical waste generation showed that 42.1% of the health centers had between 1-5 beds (eg Health Centre Umuoba Uratta- Owerri North, Okwu Uratta Health Care Centre, and Nkwogu Health Centre etc). An average of 5- 10 bed

occupancy in a week observed in some facilities like Christian Child Care Hospital and maternity. I observed that most of the facilities did not weigh their waste. This number formed 58.9% of the facilities but in all, general waste (45%) was the largest contributor of their solid waste stream. The next being infectious waste (23%) and sharps (15%) respectively. This is in line with results from (Adumanya *et al*; 2013) which showed that general waste formed 52.8% of all waste, pathological waste 18.9% and sharps 5.85% etc

Findings on medical waste collection showed that 56.1% of the facilities had no proper collection plan. Waste was mostly collected once a day by nurses or cleaners and even community health extension workers. I mostly noticed an inadequate number of receptacles and many of them were without lids. Waste was collected in a variety of receptacles like nylon bags, plastic containers/bins of different colours, cartons and cardboard boxes were mostly used for syringes and sharps, metal containers etc. Only 45% segregate their waste, colour coding as a means of waste segregation was not really practiced. A few facilities fairly practiced it. Observance was 45% but it was partial as many of the facilities did not abide world health organization coding recommendations. They mostly used waste bins donated by previous government of Imo State under the 'Clean and Green Initiative Project'. Segregation was mostly not regulated or controlled in the facilities visited. This is in line with Alexander and Ikpeze, 2009) which supported that medical waste was

collected in different receptacles or bins in Ahiazu Mbaise, Imo State as a means of sorting/ segregation. However, that study didn't say anything about colour coding observance. A study by Akingbehin *et al* (2019), showed similar result with this research as hospitals in Lagos showed colour coding observance but did not adhere to proper colour coding for segregation of solid health care waste.

On medical Waste storage, findings from this research showed inadequacy of storage containers (77.6%) in the facilities and many were without lids. 58.9% of the respondents reported that there was no specific/proper designated area for health care waste storage and 36.5% of the facilities practiced open dumping and 35.2% stored waste behind the facility building. Most of the facilities stored waste

for one day and then disposed the very next day. For some type of

anatomical/infectious wastes like placenta and wastes contaminated heavily with bodily fluids, they were put in a nylon and disposed almost immediately into pits. Most of the faclities had pits for waste disposal. 35.8% of the facilities stored waste between 2-3 days before final disposal and in this case, they spray a chemical over the waste to prevent odour/smell. 45% of the facilities maintain segregation during storage. Umegbolu and ozoejike (2017) carried out similar research in Enugu State and the result is in line with this research as 90% of the facilities had inadequate storage facilities. In another research by Macaulay and Odiase (2016) in Akure, waste

containers do not have lids, are often overfilled and are not leak proof and waste is stored within the hospital premises.

Findings of this research on knowledge, handling practices of health care workers and risks involved shows that 86.6% of health staff had no knowledge of any policy regarding waste management within their facility. 82.8% of the workers had no knowledge of any signs, symbols or any written displays in their facilities that helps educate proper waste handling/management practices and fair knowledge of risks and infectious diseases associated with poor waste handling was recorded (46.8%). There was mostly no training of staff on medical waste handling as it recorded 80% and as a result, the use of personal protective equipment by waste handlers within the health care facilities wasn't great. The most use PPE being the hand gloves (35.2%). This is in line with findings from Onoh, *et al* (2019) where 41.5% of the respondents had good knowledge of health care waste management practices. 33.3% had knowledge of steps in health care waste management and 45.3% knew of diseases transmitted through health care waste handling. However, results from Odugbem *et al,* (2014) from national orthopedic hospital Lagos had opposite findings. It observed that 57.4% of the study respondents had knowledge and 63.6% had positive attitude concerning medical waste management, also 70.2% had good medical waste management practices.

Notable facilities visited during the course of the research include; Ugbele (Awo)

Health Centre. Orie Mbieri PHC, Uchechi Maternity Home, Achi Mbieri PHC, All Saints Clinics and Maternity Umuorii Uratta, Christian Child Care Medical Centre and Maternity, Okwu Uratta Health Centre Owerri North, Health Centre Umuoba

Uratta, PHC Naze, PHC Obibi Ezena, Nkwogwu Health Centre, Enyiogugu Health Centre, Akaraugo Hospital Okpuala Naze Owerri, Aboh Health Center, Ibeku

Health Centre among others

Challenges

Some of the challenges I encountered during the research include transportation difficulty as most of the facilities were reachable using mostly motorcycles. The rain also came in the way sometimes and this lead to multiple visits and of course more expenditure than budgeted. Inadequate funds also posed its own challenges as some PHC staff were reluctant to co-operate until gifts were given to them.

Conclusion

Findings from this study on medical waste generation, collection and storage practices among Primary Health centres in Owerri zone shows that majority of the facilities has no waste management plan and policy. This may be responsible for the poor waste handling practices among facilities. It was also observed that there was inadequacy of storage containers, and many had no lids which is in wide deviation from WHO guidelines. Another observation was little knowledge of workers on

waste handling/management practices and partial knowledge of risks associated with poor medical waste management. This negatively affected their observance of segregation especially through colour coding.

Recommendations

Based on the result of this study, the following are recommended;

- Health facility management should adopt appropriate medical waste management policy to ensure compliance to local and international

  guidelines.
- For medical waste segregation, there should be proper labelling to ensure good colour coding compliance
- There should be regular training and retraining of staff of medical staff especially those involved in medical waste handling to ensure

  knowledgeability of the process and the risks involved.
- There is a need for the Environmental Health Officers to monitor regularly the management of health care wastes in each in Owerri Zone, Imo State and beyond.

- There is need to increase budgetary provision or allocation for medical waste management to enable adequate provision of all bins/receptacles and materials needed for effective medical waste management in Owerri zone, Imo state.

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APPENDIX A

QUESTIONNAIRE ON MEDICAL WASTE GENERATION, COLLECTION AND STORAGE PRACTICES AMONG PRIMARY HEALTH CENTERS IN OWERRI ZONE, IMO STATE.

Dear respondent,

I am a postgraduate student of the above named institution in pursuit of master of public health (MPH). I am carrying out a study on medical waste generation, collection and storage practices and with this questionnaire, I want to assess the above mentioned practices among primary health centers in Owerri senatorial zone, Imo state. Kindly give the best and candid answer to each question as the information you will provide is strictly for this purpose.

Tick where appropriate and you can tick multiple boxes if applicable

What type of Primary health center is this? a

Private (b) Public

SECTION ONE: SOCIO DEMOGRAPHIC DATA

1 What is the age bracket of the respondent? 18 – 30 years [ ] 30 – 40 years [ ] 40 -50 years [ ] 50-60 years [ ] above 60 years [ ]

1 What is the sex of the respondent? Male [ ] Female [ ]

2 What is the religion of the respondent? Christian [ ] Islam [ ] Traditional [ ] Atheist [ ]

3 How many years work experience has the respondent? Less than one year [ ] 1- 6years [ ] 6 -12 years (d) 12 -18 years [ ] Above 18 years [ ]

5. What is the professional qualification of the respondent? Nurse [ ] Lab. Technician [ ] Doctor [ ] Junior community health officer [ ] Senior community health officer [ ] Environmental health officer [ ]

6. Where is the Primary health center located? [ ] Rural [ ] Semi-rural [ ] Urban [ ] Semi- urban [ ]

SECTION TWO: TYPES OF HEALTH CARE WASTE GENERATED

1 Which of the following types of waste is generated in this facility? General wastes[ ] Sharps[ ] Infectious [ ] Anatomic Wastes [ ] Pharmaceutical Wastes [ ] Radioactive Waste [ ] Chemical waste [ ] All of the above [ ]

1 What type of syringes do you use in this facility? Disposable [ ]] Sterilisable [ ] Auto-disable [ ] Safety syringes [ ]

SECTION THREE: WASTE GENERATION

1 How many beds are available in this facility? None [ ] 1-5 [ ] 6-10 [ ] 1115 [ ] 16 and above [ ]

1 How many beds are currently occupied? .....

2 What is the average bed occupancy in a week?.....

3 How many outpatients come in a day?.....

4 Do you weigh your waste in this facility? Yes [ ] No [ ]

5 If yes, what is the quantity of waste generated in a day in kg? 1-5kg [ ] 510kg [ ] 10-15kg [ ] 15-20kg [ ] 20kg and above [ ]

SECTION FOUR: WASTE COLLECTION

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1 Is there a plan for waste collection in this health care facility? Yes [ ] No [ ]

1 If yes, how many times is waste collected in a day? None [] When Necessary [ ] One [ ] Two [ ] Three [ ]

2 What type of container/bags do you use to collect waste

S/N	Types of Waste	Waste Bag	Cardboard Boxes	Plastic Container	Metal Container	Lead Boxes	N/A
A	General Waste						
B	Sharps						
C	Pathological Waste						
D	Radioactive Waste						
E	Chemical Waste						
F	Pharmaceutical Waste						
G	Infectious Waste						

3 Are the receptacles or waste bins in this facility with lids? Yes [ ] No [ ]

4 Are there adequate numbers of receptacles for waste collection? Yes [ ] No [ ]

5 If no, what reasons are responsible for inadequacy of receptacle/bin shortages? Poor budgeting [ ] Insufficient Funds [ ] Theft [ ] Logistical [ ] Others ____

SECTION FIVE: COLOUR CODING/SEGREGATION

1 Do you segregate waste in this facility?

Yes [ ] No [ ]

1 If yes, into what categories are wastes segregated? (**Tick multiple boxes if applicable**)

Colour codes [ ] Sharps [ ] Infectious wastes [ ] Radioactive wastes [ ]

2 Do you use colour coded waste containers/bags for segregation in this facility? Yes [ ] No [ ]

3 If yes, what is the colour code used for health care waste collection/segregation

S/N	Types of Waste	Black	Brown	Yellow
a.	General Waste			
b.	Pathological waste			
c.	Radioactive Waste			
d.	Chemical Waste			
e.	Pharmaceutical Waste			
f.	Sharps Waste			

4 At what point in the waste stream is waste segregated in this facility? No segregation [ ] At generation [ ] During transport [ ] Storage [ ] Treatment [ ] Final disposal [ ] Collection [ ] from generation to final disposal [ ]

6. Is segregation regulated or controlled in this facility? Yes [ ] no [ ]

7. If yes, who is responsible for regulation? Lab Technician [ ] Nurses [ ]

Environmental health officer/ technician [ ] Doctors [ ] Security [ ] Cleaner [ ]

SECTION SIX: HEALTH CARE WASTE STORAGE

1 Are there any designated/specific areas for health care waste storage? Yes [ ] No[ ]

1 If yes, where is it being stored? Behind a building [ ] Put inside a waste container/bags [ ] waste storage room [ ] Open dumping [ ] Any designated place within the health care facility [ ]

2 How long do you store wastes before disposing?
One day [ ] 2-3 days [ ] One week [ ] Close to two weeks [ ] One month [ ] Beyond one month [ ]

3 Do the waste storage receptacles in this facility have lids?
Yes [ ] no[ ]

4 Is segregation maintained/practiced during storage in this facility? Yes[ ] No[ ]

5 Is there adequacy of storage containers in this facility? Yes [ ] No [ ]

SECTION SEVEN: KNOWLEDGE OF RISKS

1 Are there any symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres?
Yes [ ] No [ ]

1 Which personal protective equipment does the staff handling health care waste use?
None [ ] apron [ ] Hand gloves [ ] Boots [ ] Face and nose masks [ ]

2 Is there provision for training of staff regarding health care waste handling?
Yes[ ] No [ ]

3 If yes, what kind of training is given? Training on waste collection [ ] Training on waste storage [ ] Training on waste disposal [ ] Training on

segregation/colour coding [ ] Training on health effects of poor medical waste management [ ]

4 Whose duty is it to handle waste from generation to final disposal in your facility Nobody [ ] Security [ ] Any staff [ ] All of the above [ ] Health care waste handler [ ] Environmental health officer/ Technician [ ]

5 Are you aware of any policy on medical waste management within your health care facility? Yes [ ] no [ ]

6 If yes, is there any waste management committee to implement the policy?

a Yes [ ] No [ ]

7 Do you have knowledge of infectious diseases from poor waste handling

Yes [ ]No [ ]

8 If yes, which ones do you know? (Tick multiple boxes where applicable) Hepatitis B and C [ ] Tetanus [ ] Cuts [ ] HIV [ ] Tuberculosis [ ]

APPENDIX B

CHECKLIST ON MEDICAL WASTE GENERATION, COLLECTION AND STORAGE PRACTICES AMONG PRIMARY HEALTH CENTERS IN OWERRI ZONE, IMO STATE

Activities	**Response** Check Yes or No		Remarks
Waste segregation and collection			
Does waste segregation occur at the point where the waste is generated?	Yes	No	
Is the collected waste properly segregated?	Yes	No	
Are color-coded waste containers used in all facility areas?	Yes	No	
Are waste containers properly marked and labeled as per the waste they contain?	Yes	No	
Do all yellow containers for collecting infectious waste have lids?	Yes	No	
Are all waste containers free of leaking?	Yes	No	
Are sharps containers puncture-resistant, and leak-proof?	Yes	No	
Is appropriate aisle space maintained near the waste containers?	Yes	No	
Are the waste containers emptied at the end of each day?	Yes	No	
Are the waste containers filled no more than about threequarters full?	Yes	No	
Is segregated sharps waste sealed and labeled before transportation?	Yes	No	
Is medical waste other than sharps placed in clearly labeled heavy-duty biohazard plastic bag or yellow plastic bag?	Yes	No	
Does everyone who will be handling waste have the appropriate PPE? (Gloves, tongs)	Yes	No	
Waste storage			
Are lids of waste bins and containers closed properly during transportation from ward to central storage?	Yes	No	
Is waste storage area located away from the patients?	Yes	No	
Are the waste collection tanks completely enclosed?	Yes	No	
Are the waste collection tanks not overfilled?	Yes	No	
Is waste storage area kept clean, free from loose litter and malodorous spillages and debris?	Yes	No	
Is waste storage area free from pests and vermin?	Yes	No	
Is waste storage area well lit?	Yes	No	

Is waste storage area well ventilated?	Yes	No	
Is waste storage separated from food preparation area(s) and supply rooms?	Yes	No	
Is water supply available for cleaning purpose in the storage area?	Yes	No	
Documentation			
Are policy and procedures for medical waste management available in the storage area?	Yes	No	
Are SOPs for waste holding and storage available in the storage area?	Yes	No	
Is the record of quantity of collected waste in the storage area well maintained and up-to-date?	Yes	No	
Training			
Are storage area personnel training files up-to-date and available?	Yes	No	
Is refresher training available to all related staff at least yearly?	Yes	No	
Do personnel understand hazards and how to minimize risks?	Yes	No	
Is injury and emergency response procedure known and understood by all relevant personnel?	Yes	No	

APPENDIX C

Reliability Test and other Statistical Analysis

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	380	100.0
	Excluded[a]	0	.0
	Total	380	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.880	.940	6

Item Statistics

	Mean	Std. Deviation	N
Any symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres	1.8289	.37705	380
Any plan for waste collection within the health care facility	1.5605	.49698	380
Location of Primary health center	1.8842	.86702	380
Type of medical waste generated	2.3684	1.66638	380
Years of work experience	2.7132	1.03212	380
where is it being stored	4.5737	1.92398	380

Inter-Item Correlation Matrix

	Any symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres	Any plan for waste collection within the health care facility	Location of Primary health center	Type of medical waste generated
Any symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres	1.000	.513	.464	.374
Any plan for waste collection within the health care facility	.513	1.000	.769	.728
Location of Primary health center	.464	.769	1.000	.913
Type of medical waste generated	.374	.728	.913	1.000
Years of work experience	.694	.844	.877	.815
where is it being stored	.808	.838	.731	.610

Inter-Item Correlation Matrix

	Years of work experience	where is it being stored
Any symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres	.694	.808

Any plan for waste collection within the health care facility	.844	.838
Location of Primary health center	.877	.731
Type of medical waste generated	.815	.610
Years of work experience	1.000	.884
where is it being stored	.884	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance
Item Variances	1.447	.142	3.702	3.560	26.037	2.125
Inter-Item Covariances	.796	.096	1.957	1.861	20.357	.346
Inter-Item Correlations	.724	.374	.913	.540	2.446	.026

Summary Item Statistics

	N of Items
Item Variances	6
Inter-Item Covariances	6
Inter-Item Correlations	6

Scale Statistics

Mean	Variance	Std. Deviation	N of Items

14.9289	32.578	5.70772	6

ANOVA

		Sum of Squares	df	Mean Square	F	Sig
Between People		2057.847	379	5.430		
Within People	Between Items	2308.193	5	461.639	709.125	.000
	Residual	1233.640	1895	.651		
	Total	3541.833	1900	1.864		
Total		5599.680	2279	2.457		

Grand Mean = 2.4882

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Any symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres * Any plan for waste collection within the health care facility	380	100.0%	0	0.0%	380	100.0%

Knowledge of health workers on symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres and any plan for waste collection within the health care facility

		Any plan for waste collection within the health care facility	Total
		Yes	No	
Any symbols, signs or well written displays on methods of proper waste generation, collection, and storage within the primary health care centres	Yes	65[a]	0[b]	65
	No	102[a]	213[b]	315
Total		167	213	380

Each subscript letter denotes a subset of Any plan for waste collection within the health care facility categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests[c]

	Value	df	Asymp. Sig. (2sided)	Exact Sig. (2sided)	Exact Sig. (1sided)
Pearson Chi-Square	100.011[a]	1	.000	.000	.000

Continuity Correction[b]	97.285	1	.000		
Likelihood Ratio	124.494	1	.000	.000	.000
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	99.748[d]	1	.000	.000	.000
N of Valid Cases	380				

Chi-Square Tests[c]

	Point Probability
Pearson Chi-Square	
Continuity Correction[b]	
Likelihood Ratio	
Fisher's Exact Test	
Linear-by-Linear Association	.000[d]
N of Valid Cases	

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 28.57.

b. Computed only for a 2x2 table

c. For 2x2 crosstabulation, exact results are provided instead of Monte Carlo results.
d. The standardized statistic is 9.987.

CROSSTABS

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Location of Primary health center * Type of medical waste generated	380	100.0%	0	0.0%	380	100.0%

Location of Primary health center * Type of medical waste generated Crosstabulation

Count

		Type of medical waste generated			
		General waste	Sharp	Radioactive waste	Chemical waste
Location of Primary health center Total	Rural	145_{a}	0_{b}	0_{b}	0_{b}
	Semi-rural				
	Urban	26_{a}	57_{b}	73_{c}	0_{a}
	Semi- urban	0_{a}	0_{a}	14_{b}	15_{c}
		0_{a}	0_{a}	0_{a}	0_{a}
		171	57	87	15

Location of Primary health center * Type of medical waste generated Crosstabulation Count

		Type of medical waste generated			
		Infectious waste	Pharmaceutical waste	Anatomic waste	8.00
Location of Primary health center Total	Rural	0_{b}	0_{b}	0_{b}	$0_{a, b}$
	Semi-rural	0_{a}	0_{a}	0_{a}	$0_{a, c}$
	Urban	19_{c}	9_{b}	$0_{a, b}$	$0_{a, b}$
	Semi- urban	0_{a}	10_{b}	11_{b}	1_{b}
		19	19	11	1

Location of Primary health center * Type of medical waste generated Crosstabulation Count

		Total
Location of Primary health center	Rural	145
	Semi-rural	156
	Urban	57
	Semi- urban	

	22
Total	380

Each subscript letter denotes a subset of Type of medical waste generated categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2sided)	Monte Carlo Sig. (2-sided)	
				Sig.	95% Confidence Interval
					Lower Bound
Pearson Chi-Square	808.192[a]	21	.000	.000[b]	.000
Likelihood Ratio	649.979	21	.000	.000[b]	.000
Fisher's Exact Test	597.393			.000[b]	.000
Linear-by-Linear Association	316.268[c]	1	.000	.000[b]	.000
N of Valid Cases	380				

Chi-Square Tests

	Monte Carlo Sig. (2-sided)	Monte Carlo Sig. (1-sided)	
	95% Confidence Interval	Sig.	95% Confidence Interval

	Upper Bound		Lower Bound	Upper Bound
Pearson Chi-Square	.008[a]			
Likelihood Ratio	.008			
Fisher's Exact Test	.008			
Linear-by-Linear Association	.008[c]	.000	.000	.008[b]
N of Valid Cases				

a. 15 cells (46.9%) have expected count less than 5. The minimum expected count is .06.

b. Based on 380 sampled tables with starting seed 126474071.

c. The standardized statistic is 17.784.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Type of medical waste generated * Location of Primary health center	380	100.0%	0	0.0%	380	100.0%

Type of medical waste generated * Location of Primary health center Crosstabulation

Count

		Location of Primary health center			
		Rural	Semi-rural	Urban	Semi- urban
Type of medical waste generated	General waste	145$_{a}$	26$_{b}$	0$_{c}$	0$_{b, c}$
	Sharp	0 $_{a}$	57$_{b}$	0$_{a}$	0$_{a}$
	Radioactive waste	0$_{a}$	73$_{b}$	14$_{c}$	0$_{a, c}$
	Chemical waste	0$_{a}$	0$_{a}$	15$_{b}$	0$_{a}$
	Infectious waste	0$_{a}$	0$_{a}$	19$_{b}$	0$_{a}$
	Pharmaceutical waste	0$_{a}$	0$_{a}$	9$_{b}$	10$_{c}$
	Anatomic waste	0$_{a}$	0$_{a}$	0$_{a}$	11$_{b}$
	8.00	0$_{a, b}$	0$_{b}$	0$_{a, b}$	1$_{a}$
Total		145	156	57	22

Type of medical waste generated * Location of Primary health center Crosstabulation Count

		Total
Type of medical waste generated	General waste	171
	Sharp	57
	Radioactive waste	87
	Chemical waste	15
	Infectious waste	

Pharmaceutical waste	19
Anatomic waste	19
8.00	11
	1
Total	380

Each subscript letter denotes a subset of Location of Primary health center categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2sided)	Monte Carlo Sig. (2-sided)	
				Sig.	95% Confidence Interval Lower Bound
Pearson Chi-Square	808.192[a]	21	.000	.000[b]	.000
Likelihood Ratio	649.979	21	.000	.000[b]	.000
Fisher's Exact Test	597.393			.000[b]	.000
Linear-by-Linear Association	316.268[c]	1	.000	.000[b]	.000
N of Valid Cases	380				

Chi-Square Tests

	Monte Carlo Sig. (2-sided)	Monte Carlo Sig. (1-sided)		
	95% Confidence Interval	Sig.	95% Confidence Interval	
	Upper Bound		Lower Bound	Upper Bound
Pearson Chi-Square	.008[a]			
Likelihood Ratio	.008			
Fisher's Exact Test	.008			
Linear-by-Linear Association	.008[c]	.000	.000	.008[b]
N of Valid Cases				

a. 15 cells (46.9%) have expected count less than 5. The minimum expected count is .06.
b. Based on 380 sampled tables with starting seed 1487459085.

c. The standardized statistic is 17.784.

```
CROSSTABS
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  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=BPROP
  /COUNT ROUND CELL
  /METHOD=MC CIN(95) SAMPLES(380).
```

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Years of work experience * where is it being stored	380	100.0%	0	0.0%	380	100.0%

Years of work experience * where is it being stored Crosstabulation

Count

		where is it being stored		
		Behind a building	Put inside a waste container/bags	Waste storage room
Years of work experience	Less than one year	55[a]	1[b]	0[b]
	1- 6years	0[a]	30[b]	8[b]
	6 -12 years	0[a]	0[a]	0[a]
	12 -18 years	0[a]	0[a]	0[a, b]
	Above 18 years			
Total				

	0_a	0_a	0_a
	55	31	8

Years of work experience * where is it being stored Crosstabulation Count

		where is it being stored		
		Open dumping	Any designated place within the health care facility	None of above
Years of work experience	Less than one year	0_b	0_b	0_b
	1- 6years	57_b	5_b	0_a
	6 -12 years	0_a	$0_{a, b}$	125_b
	12 -18 years	0_a	$0_{a, b}$	95_b
	Above 18 years	0_a	0_a	4_a
Total		57	5	224

Years of work experience * where is it being stored Crosstabulation

Count

		Total
Years of work experience	Less than one year	56
	1- 6years	100
	6 -12 years	125
	12 -18 years	95
	Above 18 years	4
Total		380

Each subscript letter denotes a subset of where is it being stored categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2sided)	Monte Carlo Sig. (2-sided)	
				Sig.	95% Confidence Interval
					Lower Bound
Pearson Chi-Square	749.756[a]	20	.000	.000[b]	.000
Likelihood Ratio	709.404	20	.000	.000[b]	.000
Fisher's Exact Test	655.761			.000[b]	.000

Linear-by-Linear Association	296.376[c]	1	.000	.000[b]	.000
N of Valid Cases	380				

Chi-Square Tests

	Monte Carlo Sig. (2-sided)	Monte Carlo Sig. (1-sided)		
	95% Confidence Interval	Sig.	95% Confidence Interval	
	Upper Bound		Lower Bound	Upper Bound
Pearson Chi-Square	.008[a]			
Likelihood Ratio	.008			
Fisher's Exact Test	.008			
Linear-by-Linear Association	.008[c]	.000	.000	.008[b]
N of Valid Cases				

a. 15 cells (50.0%) have expected count less than 5. The minimum expected count is .05.

b. Based on 380 sampled tables with starting seed 1507486128.

c. The standardized statistic is 17.216.

```
CROSSTABS
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  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=BPROP
```

/COUNT ROUND CELL

/METHOD=MC CIN(95) SAMPLES(380).

where is it being stored * Years of work experience Crosstabulation

Count

		Years of work experience		
		Less than one year	1- 6years	6 -12 years
where is it being stored	Behind a building	55[a]	0[b]	0[b]
	Put inside a waste container/bags	1[a]	30[b]	0[a]
	Waste storage room	0[a, b]	8[b]	0[a]
	Open dumping	0[a]	57[b]	0[a]
	Any designated place within the health care facility	0[a]	5[a]	0[a]
	None of above	0[a]	0[a]	125[b]
Total		56	100	125

where is it being stored * Years of work experience Crosstabulation

Count

	Years of work experience	Total

		12 -18 years	Above 18 years	
where is it being stored	Behind a building	0_b	0_b	55
	Put inside a waste container/bags	0_a	$0_{a, b}$	31
	Waste storage room	0_a	$0_{a, b}$	8
	Open dumping	0_a	$0_{a, b}$	57
	Any designated place within the health care facility	0_a	0_a	5
	None of above	95_b	4_b	224
Total		95	4	380

Each subscript letter denotes a subset of Years of work experience categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2sided)	Monte Carlo Sig. (2-sided)	
				Sig.	95% Confidence Interval
					Lower Bound
Pearson Chi-Square	749.756[a]	20	.000	.000[b]	.000
Likelihood Ratio	709.404	20	.000	.000[b]	.000
Fisher's Exact Test	655.761			.000[b]	.000

Linear-by-Linear Association	296.376[c]	1	.000	.000[b]	.000
N of Valid Cases	380				

Chi-Square Tests

	Monte Carlo Sig. (2-sided)	Monte Carlo Sig. (1-sided)		
	95% Confidence Interval	Sig.	95% Confidence Interval	
	Upper Bound		Lower Bound	Upper Bound
Pearson Chi-Square	.008[a]			
Likelihood Ratio	.008			
Fisher's Exact Test	.008			
Linear-by-Linear Association	.008[c]	.000	.000	.008[b]
N of Valid Cases				

a. 15 cells (50.0%) have expected count less than 5. The minimum expected count is .05.

b. Based on 380 sampled tables with starting seed 1131884899.

c. The standardized statistic is 17.216.

APPENDIX D

Summary of Total Number of Primary Health Centres in Owerri Zone

	Primary		**Secondary**		**Tertiary**		**Total**
	Public	**Private**	**Public**	**Private**	**Public**	**Private**	
➢ Aboh Mbaise - 14	20	1	18	0	0	53
➢ Ahiazu Mbaise – 21	10	1	10	0	0	42
➢ Ezinihitte – 9	9	1	24	0	0	43
➢ I keduru – 15	38	1	30	0	0	84
➢ Mbaitoli – 17	31	2	12	0	0	62
➢ Ngor Okpala – 18	8	1	13	0	0	39
➢ Owerri Municipal - 4	16	1	100	1	0	122
➢ Owerri North – 20	14	0	54	0	0	88
➢ Owerri West - 20	18	1	13	0	0	52
138	**164**					**585**

There are 302 primary health centers in the 9 Local governments that make up Owerri zone.

138 are public and 164 are private

(source, Imo state health care facility listing, 2018)

APPENDIX E

List of PHC's in Aboh-Mbaise, Mbaitoli and Owerri North LGA's

IMO STATE									
HEALTH FACILITY LISTING									
LGA	**WARD**	**NAME OF HEALTH FACILITY**	**FACILITY TYPE**	**OWNERSHIP (PUBLIC/PRIVATE)**	**CODE**				
					STATE	**LGA**	**FACILITY TYPE**	**OWNERSHIP**	**FACILITY NO**
Aboh Mbaise	Ahiata	PHC Umueze	PRIMARY	Public	16	01	1	1	0037
	Enyiogugu	Ikechukwu Mat. Home Enyiogugu	PRIMARY	Private	16	01	1	2	0041
		Enyiogugu Disp.	PRIMARY	Public	16	01	1	1	0042
	Amuzu	Amuzu Mat. Home	PRIMARY	Public	16	01	1	1	0045
		Community Hosp. Eziala Ngugu	PRIMARY	Private	16	01	1	2	0046

	Umueato	Ascension Mat. Home Eziala Ihenweke	PRIMARY	Private	16	01	1	2	0047
	Lorji	Queen of Peace Mat. Home Eziala Lorji	PRIMARY	Private	16	01	1	2	0049
	Okwuato	St. Paul's Mat. Home Umuhu Okwato	PRIMARY	Private	16	01	1	2	0050
		Igboji	PRIM	Private	16	01	1	2	0051
		Nwachukwu Mat. Home Obazu Lagwa	ARY						
	Lagwu	Ezinwunye Mat. Home Egbelu Lagwa	PRIMARY	Private	16	01	1	2	0052
		CHIOMA Mat. Home Onuokwu Lagwa	PRIMARY	Private	16	01	1	2	0053
	Nguru Nweke	Mrs. S. Osuji Mat. Home Ezuhu Nguru	PRIMARY	Private	16	01	1	2	0003
		Nkwongwu Health Centre	PRIMARY	Public	16	01	1	1	0005

		Kenneth Memo Mat. Home Nguru	PRIMARY	Private	16	01	1	2	0006
	Mbutu II	St. Judes Mat. Home Mbutu Ngwa	PRIMARY	Private	16	01	1	2	0016
	Mbutu IV	Primary Health Centre isiala Mbutu	PRIMARY	Public	16	01	1	1	0017
		Primary Health Centre Nkwuogwu	PRIMARY	Public	16	01	1	1	0018
	Mbutu V	Primary Health Centre Umuhu	PRIMARY	Private	16	01	1	1	0019
		Basic Health Centre Uvuvu	PRIMARY	Private	16	01	1	1	0020
		Uvuvu Disp.	PRIMARY	Private	16	01	1	1	0021
	Uvuvu I	Assumpta Mat. Home Uvuuv	PRIMARY	Public	16	01	1	2	0022
		Immaculate Health Mat. Uvuvu	PRIMARY	Private	16	01	1	2	0023

		Chiagoziem Mat. Home Uvuvu	PRIMARY	Private	16	01	1	2	0024
	Ahiato II	Sacred Health Mat. Home Nguru	PRIMARY	Private	16	01	1	2	0025
		Holy Rosary Mat. Home Ngor	PRIMARY	Private	16	01	1	2	0026
	Uvuvu II	Cottage Clinic Ogbor Nguru	PRIMARY	Private	16	01	1	2	0027
		Peoples Mat. Home Afor Ajala Nguru	PRIMARY	Private	16	01	1	2	0030
		WAST Mat. Home	PRIMARY	Private	16	01	1	2	0032
		Umuanuma Nguru							
		PHC Ahiato Afor Ajala	PRIMARY	Public	16	01	1	1	0033
		Ibeku Ibeku	PRIMARY	Public	16	01	1	1	0034
	Ibeku	St. Gerald Mat. Home Ibeku Okwato	PRIMARY	Private	16	01	1	2	0035
		Ibeku HC	PRIMARY	Public	16	01	1	1	0036

Mba itoli		Ogwa Dispensary	PRIM ARY	Public	16	11	1	1	0001
		PHC Ogwa	PRIM ARY	Public	16	11	1	1	0002
		PHC Umuaro Umunneta	PRIM ARY	Public	16	11	1	1	0003
		Mabel Mat. Umuopara nyanyu	PRIM ARY	Public	16	1	1	2	0004
		ST. Mary's Mat. Idem Ogwa	PRIM ARY	Public	16	11	1	2	0005
		St. Mary's Mat. Umuouru Ogwa	PRIM ARY	Public	16	11	1	2	0006
	Ogwa II	Anglican Mat. Home Alaenyi Ogwa	PRIM ARY	Public	16	11	1	2	0007
		General Hosp. Alaenyi	PRIM ARY	Public	16	11	1	2	0008
		Ogwa							
		Ezinwanne dinma Mat. Umuanu Ogwa	PRIM ARY	Public	16	11	1	2	0009
		Gilead Missionary Clinic Umujam	PRIM ARY	Public	16	11	1	2	0014

		Community Mat. Home Obazu Mbieri	PRIMARY	Public	16	11	1	2	0015
		Ngozi Mat. Home Obilubi	PRIMARY	Public	16	11	1	2	0016
		PHC Ogbaku	PRIMARY	Public	16	11	1	1	0017
		Comprehensive Health Centre Ogbaku	PRIMARY	Public	16	11	1	1	0018
		Comprehensive Health Centre Ezi Ogbaku	PRIMARY	Public	16	11	1	1	0019
		Nwaorieubi PHC	PRIMARY	Public	16	11	1	1	0020
		St. Joseph's Transit Mat. Ezi-Ogbaku	PRIMARY	Public	16	11	1	2	0021
		Ugonna Mat. Home Okwu	PRIMARY	Public	16	11	1	2	0022
		Ogbaku							
		Chioma Clinic Ogbaku	PRIMARY	Public	16	11	1	2	0023
		St. Philomena Mat. Ogbaku	PRIMARY	Public	16	11	1	2	0024

		PHC Umueze Umuomumu Amaike Mbieri	PRIMARY	Public	16	11	1	1	0028
		Onyemachi Mat. Home Umuahi Mbieri	PRIMARY	Public	16	11	1	2	0029
	Amaike	Chikodinaka Mat. Umua	PRIMARY	Public	16	11	1	2	0030
		Apugo Medical Centre Amaike	PRIMARY	Private	16	11	1	2	0031
	Umuebohoa	Ohohia PHC	PRIMARY	Public	16	11	1	1	0033
	Umunoha	PHC Umu	PRIMARY	Public	16	11	1	1	0035
	Umunoha Azara	Jesus The Way Mat. Home Umubeke Umunoha	PRIMARY	Private	16	11	1	2	0036
		PHC Umumbara Umunoha	PRIMARY	Public	16	11	1	1	0037
	Awo	PHC Owo Mbieri	PRIMARY	Public	16	11	1	1	0038
		PHC Orie Mbieri	PRIMARY	Public	16	11	1	1	0039
	Ezi	PHC Mbaitoli East Mbieri	PRIMARY	Public	16	11	1	1	0040

		Uchechi Mat. Home Mbieri	PRIMARY	Private	16	11	1	2	0041
		Cottage Clinic Egbeada	PRIMARY	Private	16	11	1	2	0042
		PHC Obi Orodo	PRIMARY	Public	16	11	1	2	0043
		Charity Mat. Ubaha Orodo	PRIMARY	Private	16	11	1	2	0044
		St. Joseph Mat. Home Orodo	PRIMARY	Private	16	11	1	1	0046
	Amaukwu	Obed Mat. Amaukwu Orodo	PRIMARY	Private	16	11	1	2	0047
		Chiaka Mat. Ubomiri	PRIMARY	Private	16	11	1	2	0048
		Santa Mat. Amaukwu Orodo	PRIMARY	Private	16	11	1	2	0049
		Queen of Peace Mat. Eziama Obiato	PRIMARY	Private	16	11	1	2	0050
	Eziama Obiato	Chigozie Mat. Home Eziama Obiato	PRIMARY	Private	16	11	1	2	0051
		Ezeiama Obiato	PRIMARY	Public	16	11	1	1	0052
		Dispensary							

		Our Lady of Ladies Mat. Home Amauburu	PRIMARY	Private	16	11	1	2	0053
		Chinedu Mat. Home Ubomiri	PRIMARY	Private	16	11	1	2	0054
		PHC Nwaorieubi Umudurumba	PRIMARY	Prublic	16	11	1	1	0055
		Chidubem Mat. Home Ubomiri	PRIMARY	Private	16	11	1	2	0056
		Mrs. Nwaiwu Mat. Home Umuchile wa Ifakala	PRIMARY	Private	16	11	1	2	0057
		Aunt. Nurse Nwawume Mat. Oboro Ifakala	PRIMARY	Private	16	11	1	2	0058
		Mrs. Sabina Okorie Mat. Odumara Umuomu	PRIMARY	Private	16	11	1	2	0059
	Emekuku I	Health Post Okwu Emeka	PRIMARY	Private	16	26	1	1	0001
		Irish Vision	PRIMARY	Private	16	26	1	2	0002

		World Ezeogba Emekuku							
	Emekuku II	Health Post Uboegbelu	PRIMARY	Public	16	26	1	1	0010
		PHC Orji	PRIMARY	Public	16	26	1	1	0011
		PHC Nkwo Emeke	PRIMARY	Public	16	26	1	1	0012
	Egbu I	Health Post Egbu	PRIMARY	Public	16	26	1	1	0013
		Health Post Emeke	PRIMARY	Public	16	26	1	1	0013
		Chioma Mat. Out Rd. Amekohia	PRIAMRY	Private	16	26	1	2	0031
		Gemiri Mat. Home Amakohia	PRIMARY	Private	16	26	1	2	0032
		Health Post Akwakuma	PRIMARY	Public	16	26	1	1	0040
	Orji I	Umuandala PHC	PRIMARY	Public	16	26	1	1	0041
		Uchendu Mat. Orji Uratta	PRIMARY	Private	16	26	1	2	0042
		Chnonyerem Mat. Orji	PRIMARY	Private	16	26	1	2	0043
		Ogucheala Mat. Orji	PRIMARY	Private	16	26	1	2	0044
		New Mat. Orji	PRIMARY	Private	16	26	1	2	0045
	Naze	PHC Nze	PRIMARY	Public	16	26	1	1	0058

	Emii I	Felicia Cankwe Mat.	PRIMARY	Private	16	26	1	2	0061
		Umuawuka Emii							
	Emii II	PHC Emii	PRIMARY	Public	16	26	1	1	0063
	Agbala/Ulakwo	Agbala Health Post	PRIMARY	Public	16	26	1	1	0070
		Ulakwo Health Post	PRIMARY	Public	16	26	1	1	0071
	Obibi Uratta I	Umuoba Health Centre	PRIMARY	Public	16	26	1	1	0072
		Okwu Uratta Health Post	PRIMARY	Public	16	26	1	1	0073
		Christian Child Care Mat. Umuoba Uratta	PRIMARY	Private	16	26	1	2	0074
		Pioner Street Mat. Uratta	PRIMARY	Private	16	26	1	2	0075
	Obibi Uratta II	PHC Owaelu	PRIMARY	Public	16	26	1	1	0077
		PHC Ekeobi	PRIMARY	Public	16	26	1	1	0078
		Ugbelu Health Post	PRIMARY	Public	16	26	1	1	0079
		Chisom Mat. Amaori	PRIMARY	Private	16	26	1	2	0080
		Ogooma PHC	PRIMARY	Public	16	26	1	1	0082

		Umuegblu PHC	PRIMARY	Public	16	26	1	1	0083
		PHC Obube Ekeobi	PRIMARY	Public	16	26	1	1	0084
		Immaculate Heart Mat. Egbelu-Obube	PRIMARY	Private	16	26	1	2	0085
		Anglican Mat. Egbelu-Obube	PRIMARY	Private	16	26	1	2	0086
	Obibi Ezena	BHC Obibi Ezena	PRIMARY	Public	16	26	1	1	0088

APPENDIX F

Sample Size Derivation

Step 1: The researcher randomly chose 1/3 of the nine (9) local government in

Owerri zone to give Aboh Mbaise, Mbaitoli and Owerri northL.G.A's. These L.G.A's contain altogether 116 PHC'S.

L G A	**PUBLIC**	**PRIVATE**
Aboh Mbaise	14	20
Mbaitoli	17	31
Owerri North	20	14
Total	51	65

There are 51 public PHC's in the three LGA's and 65 private PHC's

Step 2: Sample all the public PHC's in the three (3) local government and randomly choose 1/3rd of them as sample size for public PHC's

$\frac{1}{3} \times \frac{51}{1}$ = 17 PHC's.

Therefore to get the exact number of public PHC's per LGA chosen into the study, we divide the above result by the three local government areas to give $\frac{17}{3} = 5.6$

Approximately = 5- 6 public PHC's will be visited in Aboh Mbaise, Mbaitoli and Owerri North LGAs.

Therefore the total number of public primary health centers to be used as representative of the others in the three LGA's are 5 in Aboh Mbaise, 6 in Mbaitoli, and 6 in Owerri North LGA = 17 public PHC's.

Private primary health centers, all the listed PHC's will be sampled and a $^{1}/3^{rd}$ of them will be randomly chosen as sample size for private PHC's.

$\frac{1}{3} \times 65 = 21.67$ PHC's

To get the exact number of private PHC to be chosen per LGA, we divide the above result by the 3 local government areas ie $\frac{21.67}{3} = 7.22$

Approximately 7 private PHCs will be visited in Aboh Mbaise, Mbaitoli and

Owerri North LGAs. Therefore, total number of private PHC's to be used as sample are $7 \times 3 = 21$

Ie 21 Private PHCs

Sample size

Sample size is therefore calculated as $(6+6+5)3 + (7\times3) = 38$**.**

Therefore a total of 38 Primary Health centers is the sample size for the research work.

APPENDIX G

Photos from Fieldwork


HEALTH CENTRE
UMUOBA URATTA
OWERRI NORTH L.G.A
IMO STATE
ADDRESS: NKWO UMUOBA MARKET SQUARE
INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


BHCPF
INO STATE PRIMARY HEALTH CARE DEVELOPMENT AGENCY (ISPHCDA
OKNU URATTA HEALTH CENTRE
BASIC HEALTH CARE MINIMUM SERVICES
ALL ADULTS
•FAMILY PLANNING •HYPERTENSION
•TREATMENT OF MINOR AILMENTS•SCREENING FOR DIABETES
CHILDREN UNDER 5
• IMMUNIZATION •VIT. A SUPPLEMENT•DEWORMING
• TREATMENT OF CHILDHOOD ILLNESS (MEASLES, KWASHIORKOR)
PREGNANT MOTHERS
• ANTENATAL CARE•DELIVERY•POSTNATAL
LABORATORY SERVICES
COURTESY: BASIC HEALTH CARE PROVISION FUNDS


Worship with us@
OKWU URATTA
HEALTH CENTRE
OW. NORTH L.G.A.
IMO STATE.
INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA

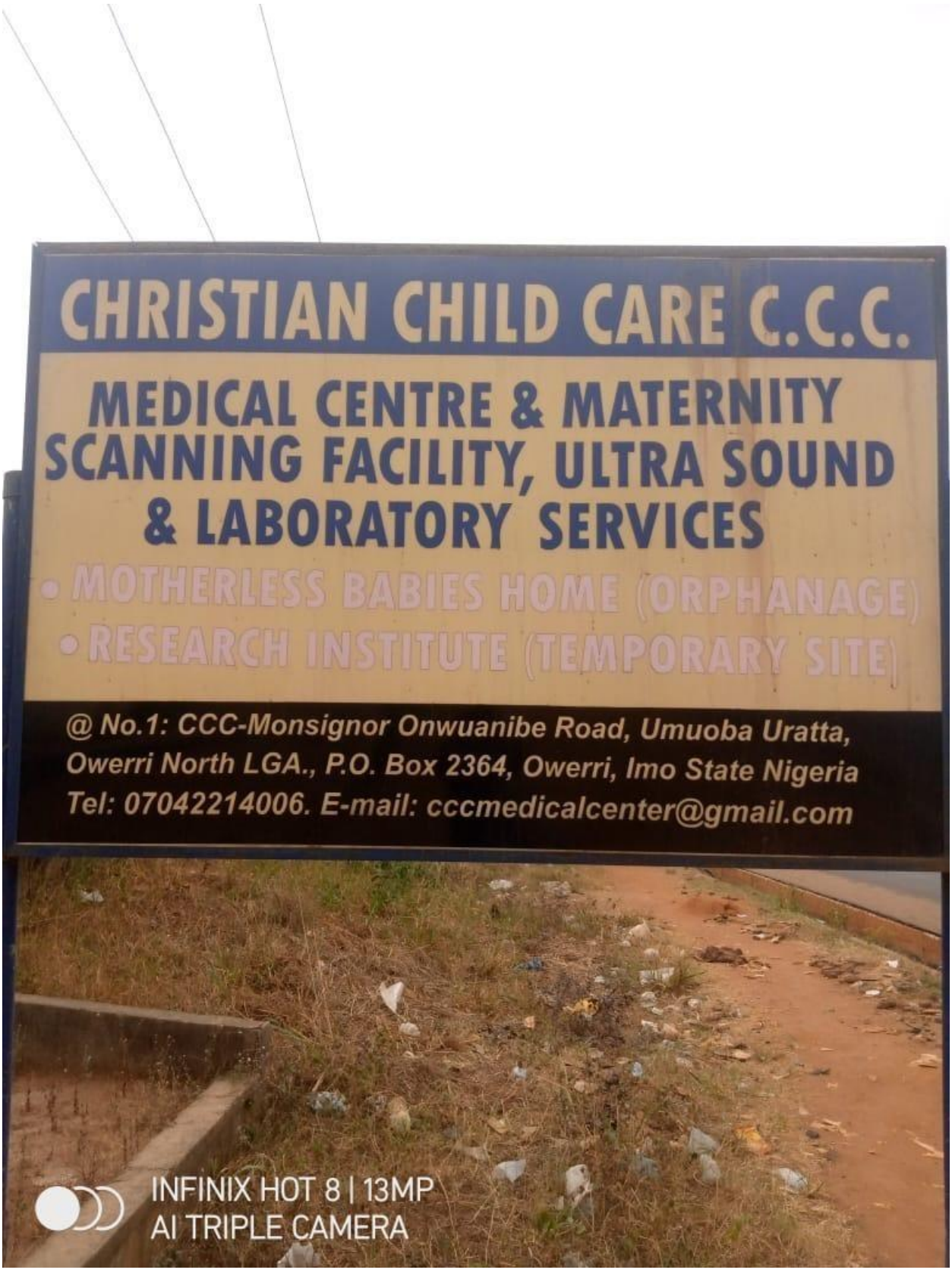

INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 I 13MP
AI TRIPLE CAMERA


Safety Box
INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


CHRISTIAN CHILD CARE C.C.C.
MEDICAL CENTRE & MATERNITY
SCANNING FACILITY, ULTRA SOUND
& LABORATORY SERVICES
• MOTHERLESS BABIES HOME (ORPHANAGE)
• RESEARCH INSTITUTE (TEMPORARY SITE)
@ No.1: CCC-Monsignor Onwuanibe Road, Umuoba Uratta,
Owerri North LGA., P.O. Box 2364, Owerri, Imo State Nigeria
Tel: 07042214006. E-mail: cccmedicalcenter@gmail.com
INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA

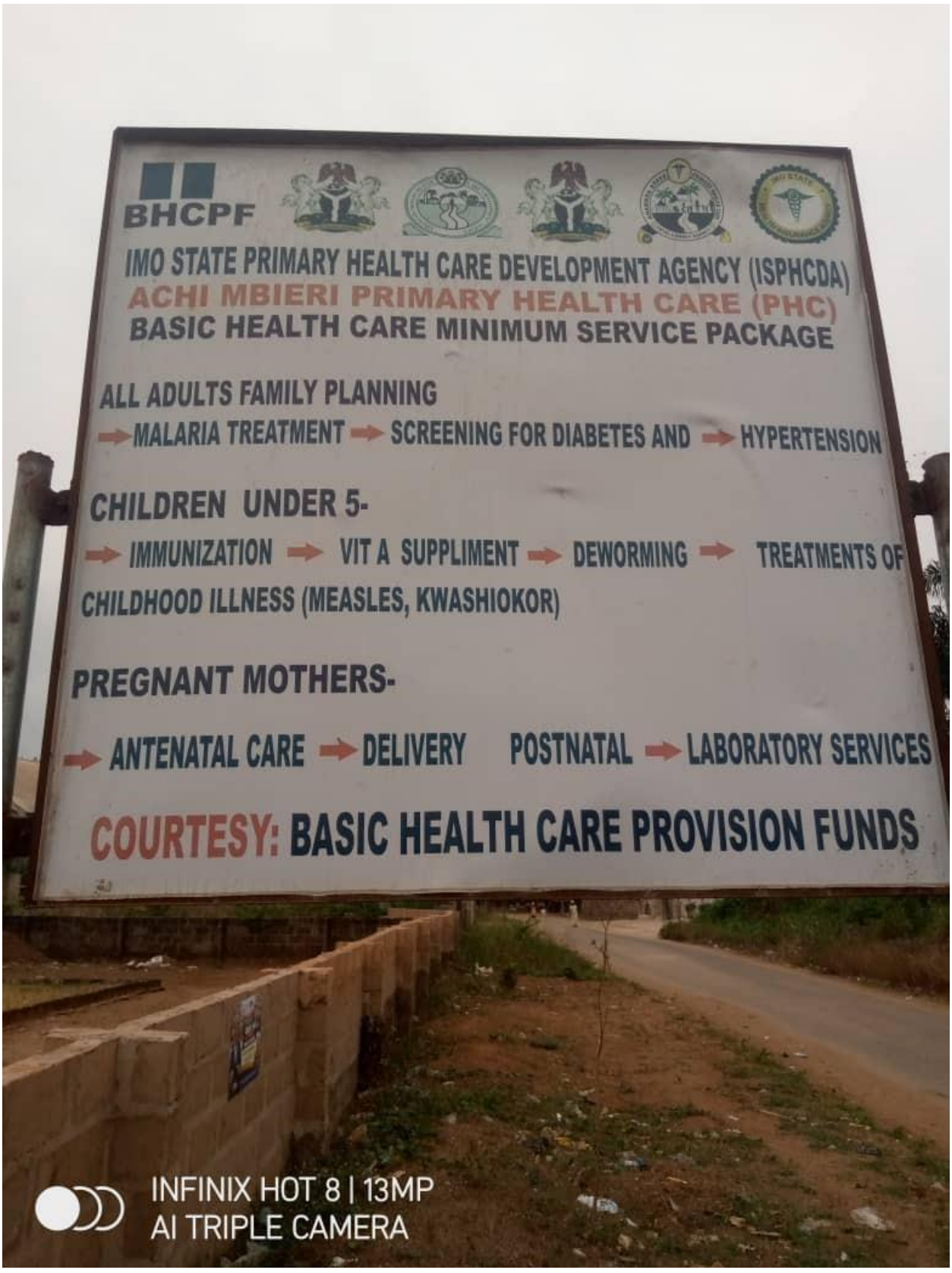

INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


ALL SAINTS
CLINIC & MATERNITY
WITH
LABORATORY SERVICES
ANTENATAL CLINIC: THURSDAYS 9AM
24HRS EMERGENCY SERVICES
UMUORII URATTA OW.NORTH
INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


BHCPF
IMO STATE PRIMARY HEALTH CARE DEVELOPMENT AGENCY (ISPHCDA)
ACHI MBIERI PRIMARY HEALTH CARE (PHC)
BASIC HEALTH CARE MINIMUM SERVICE PACKAGE
ALL ADULTS FAMILY PLANNING
→ MALARIA TREATMENT → SCREENING FOR DIABETES AND → HYPERTENSION
CHILDREN UNDER 5-
→ IMMUNIZATION → VIT A SUPPLIMENT → DEWORMING → TREATMENTS OF CHILDHOOD ILLNESS (MEASLES, KWASHIOKOR)
PREGNANT MOTHERS-
→ ANTENATAL CARE → DELIVERY POSTNATAL → LABORATORY SERVICES
COURTESY: BASIC HEALTH CARE PROVISION FUNDS
INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


UCHECHI
INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA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AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


UGBELE (AWO)
HEALTH CENTRE
NHIS\MDG\MCH PROJECT
INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


UGBELE HEALTH CENTRE
AWO KINGDOM
INFINIX HOT 8 | 13MP
AI TRIPLE CAMERA


JUMBO
8


Macephin


Safety Box


OBIBIEZENA
BASIC HEALTH CENTRE
OBIBIEZENA
RE-ROOFING OF OBIBIEZENA
HEALTH CENTRE
OBIBIEZENA UNION UK


AKARUGO HOSPITAL
(ANNEX)
-MATERNITY -SURGERY
-ULTRA SOUND -LABORATORY
OKPUALA NAZE OW
ASSEMBLIES OF GOD CHURCH
Okpuala Naze
ASSEMBLIES OF GOD
AG


CATHOLIC DIOCESE OF AHIARA
HOLY ROSARY HOSPITAL
ABOH MBAISE IMO STATE
SERVICES CHEMISTRY TESTS
SERVICES AVAILABLE
SCAN SERVICES


COMBIART
Safety Box


ENYIOGUGU HEALTH
CENTRE
ENOVATION BY
NATIONAL HEALTH CARE
DEVELOPMENT AGENCY ABUJA
UNDER GAVI HSS INFRASTRUCTURAL
INTERVENTION SCH
JULY, 2012 IMO S
WORKERS NEEDED
0806599312


NKWOGWU HEALTH
CENTRE
ABOH-MBAISE L.G.A
IMO STATE