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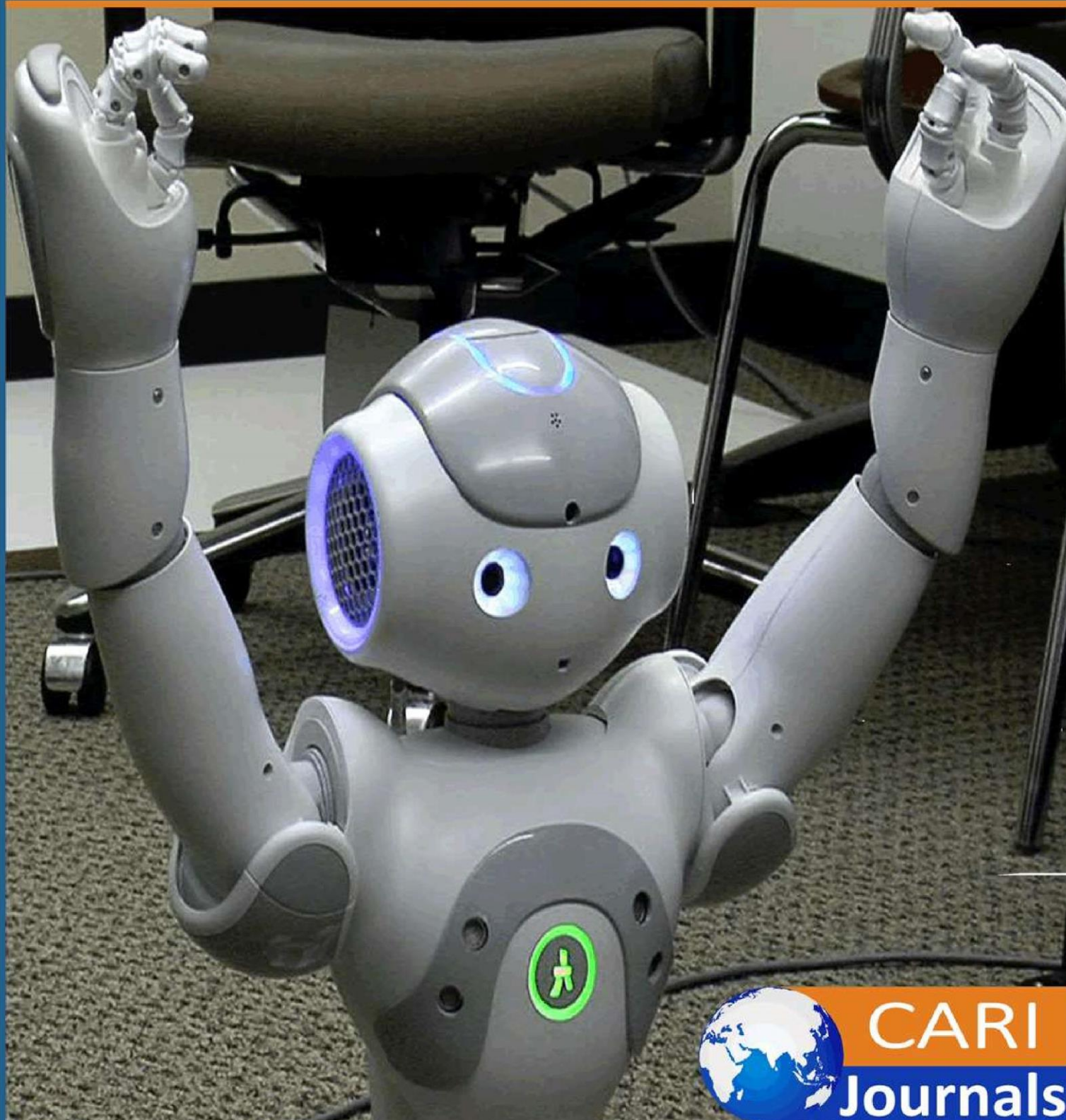

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Generation and Composition of Medical Waste in Lafia

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Abstract

Background: Effective management of medical waste is a prerequisite for efficient delivery of healthcare services, human health and environmental protection; and the availability of adequate data with regard to medical waste generation and composition is generally considered to be fundamental in the development of efficient medical waste management. However, in Lafia, the state capital of Nasarawa State, Nigeria and a rapidly developing town, there is inadequate information on the medical waste generation and composition. This study thus sets to evaluate the medical waste composition and generation in Lafia by direct observation during both rainy and dry seasons

Methodology: The study involved the survey of a cross section of three (3) tertiary health institution.

Findings: The study showed that there is significant variation in healthcare waste management practices and sustainability factors (Reduce, Reuse and Recycle) (3Rs). The test showed that there prominent method of healthcare waste management at the studied institution was practice of incineration, pit burning and burying and frequency of waste disposal, leaving out other new and improved technologies for proper waste managements. This study aims to evaluate the medical waste generation and composition in Lafia, Nasarawa State, Nigeria across public and private hospitals.

Unique Contribution to Theory, Practice and Policy: It is anticipated that the outcome of this research will avail resourceful data that will be needed for effective hospital waste management and other planning and design works.

Key words: *Healthcare Waste Management Practices, Environmental Hazard, Physical Planning and Sustainability.*

I. Introduction

Medical care also termed healthcare is essential to life and wellbeing [1, 2, 3], however medical waste includes expired, unused, split and contaminated pharmaceutical products, drugs, vaccines and sera that need to be disposed appropriately. It also includes discarded items contaminated from use in the handling of pharmaceuticals, such as bottles or boxes with residues, masks, connecting tubes, syringe, bodies and drugvials and by-products that could threaten life and wellbeing [4, 5].Currently, there are several terms used to describe the waste generated from medical care activities such as; healthcare waste, hospital waste; medical waste, health facility waste, biomedical waste and clinical waste [6, 7, 8]. Some of the terms are sometimes used interchangeably and the choice of term is usually based on factors, such as geographic location, individual discretion, organization preference etc.; for instance, "healthcare waste (HCW)" is the preferred term by the world health organization (WHO).

This study uses the term "medical waste" given it is one of the widely used term in Nigeria, the location of this study, as noted in the following studies [9, 10, 11, 12, 13, 14, 15, 16, 17, 18]. Interestingly, the term medical waste has been variedly defined, indicative, articles like [10, 19, 20, 21, 22, 23, 24, 25, 26]referred to the term medical waste as the total waste stream generated in the course of healthcare activities:; whereas studies like [27, 28, 29, 30] referred to the term as pathogenic or potentially pathogenic materials generated as a result of diagnosis, treatment or immunization of human beings or animals which is a subset of waste generated in the course of healthcare activities. In this study, the term medical waste is used to represent the total waste stream generated in the course of healthcare activities.

According to [31] the various types of medical wastes generated from medical care activities are broadly grouped into general wastes/non-hazardous waste which constitutes about 75 % to 90 %; and hazardous wastes which constitutes about 10 % to 25 % (the percentage composition is a rough estimate which is subject to variation across hospitals and regions). Although only a small fraction of medical waste is hazardous (10 % to 25 %), mismanagement of medical waste poses significant environmental and health hazards that could even pose greater threat and hazards than the original diseases [11, 26, 32, 33]. Therefore, health policy makers and professionals have come to a consensus that efficient management of medical waste is an integral part of quality healthcare service delivery [34].

Various researchers such as[5, 7, 28, 35, 36, 37, 38, 39, 40, 41]have asserted that the availability of enough information about the amount and composition of the generated medical waste is fundamental for the implementation of sustainable and efficient medical waste management systems. Interestingly the generation rate and composition of medical waste varies among the type of healthcare facility and across geographic locations [41].Therefore, the generation rate and composition should be estimated separately, considering environmental and economic status [40].

This study therefore investigate the medical waste generation rate and composition in Lafia, Nasarawa State, Nigeria, a fast-developing town; given it is currently lacking this information requisite for efficient planning of medical waste systems and sustainable management.

I Aims and objectives of study

These study evaluated the medical waste generation and composition in Lafia, Nasarawa State, Nigeria across public and private hospitals, using a case study of four selected groups of hospitals and clinics responsible to different authorities.

In achieving the aim, the study objectives are:

a) To collect Medical Waste Data using statistical analysis
b) To identify the Environmental risk caused by medical waste.
c) To identify the factors responsible for medical waste categorization.

II Statement of the research problem

In recent times, medical waste management is one of the trust areas drawing global attention given its environmental and health hazards. Several studies have reported some of its health and environmental risks; notable among such is the WHO report indicating that unsafe disposal of unsterilized syringes cause between 8 to 16 million cases of hepatitis B, 2.3 to 4.7 million cases of hepatitis C, and 80,000 to 160,000 cases of HIV annually; reports of [36] attributing the outbreak of severe acute respiratory syndrome (SARS) in 2003 to mismanagement of medical wastes; reports by [42] avowing medical waste as the fourth largest emitter of mercury to the environment; and [43] showing that mismanagement of hazardous medical waste can interrupt ecological balance.

Consequently, adequate management of medical waste has become an imperative environmental and public health issue; and the availability of adequate data regarding medical waste generation and composition is generally considered to be fundamental in the development of efficient medical waste management. However, in Lafia, the State capital of Nasarawa State, Nigeria and a rapidly developing town, there is inadequate information on the medical waste generation and composition. Therefore, these research aimed to fill the existing information by assessing the existing medical waste generation rate and composition in Lafia Nasarawa State.

III. The Study Area

Lafia is the capital of Nasarawa state, Nigeria, with a population of 317,985 as of 2006 [117]. It falls within latitudes 9°11’ N to 9°20’ N and longitudes 12°23’ E to 12°33’ E, at an altitude of about 185.9 m[118]. The area is characterized by broadly flat topography with gentle undulations and hill ranges [118]. The major occupations of the people are farming, trading, and civil servants [117]. They also engage in local crafts such as blacksmithing, calabash decoration, cap making and clothes design [117]. A map of the study area is presented in Figure 3.1.

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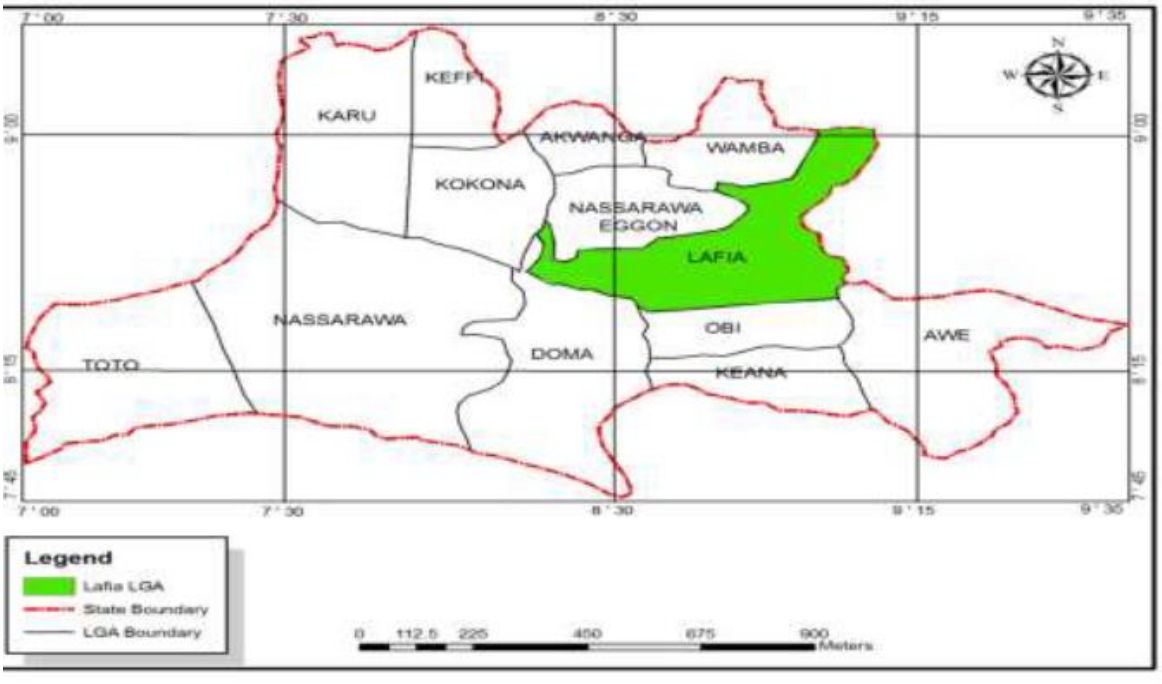

Figure 3. 1: Map of study area

IV Justification; -

Medical waste requires increased attention and diligence to avoid the extensive hazards associated with poor management practices. However, in many developing countries like Nigeria, medical waste management has received less attention and low priority.

On the premise that, adequate information and data on the prevailing medical waste generation and composition in an environment is requisite for planning and development of efficient and sustainable management schemes peculiar to the environment; it becomes imperative to access the current medical waste generation and composition in Lafia.

The outcome of these study will therefore provide useful information on the prevailing Healthcare Waste Management (HWM) practices in Lafia, Nasarawa State Capital, and its conformity to standard practice. The information generated from these study is envisaged to enable policy makers, program designers and health workers to improve healthcare waste management systems and hence improve infection prevention and control at healthcare facilities in Lafia.

V. Methodology

The focus of the survey aspect of the research includes all residents residing within these areas. Primary data was collected through questionnaires using random sampling for the residential questionnaire. The field survey was inclusive of all areas within research scope. The research boundaries of the study include the system elements of the integrated solid waste management system.

Table 3. 1: Details of selected medical facilities

Facility category	Name of selected facility
Tertiary facility	Dalhatu Araf specialist hospital
Primary healthcare centers	Comprehensive Primary Healthcare Centre, Kwandare. Primary Healthcare Centre, Lafia East.
Private hospitals	Agu hospital Kowa hospital

A Sampling

Five (5) medical facilities in three categories namely, tertiary facility, primary healthcare centers and private hospitals are purposive sampling method. The choice of the proposed facilities is aimed at studying facilities that adequately represents the medical facilities in the town. The names of the selected hospitals in the three categories are presented in Table 3.1.

Primary data were collected through questionnaires using random sampling for the health facilities questionnaire. The field survey was inclusive of all areas within research scope. The research boundaries of the study include the system elements of the integrated Medical Waste Management System.

The targeted area planned for this survey were the stockrooms (for equipment / medications and vaccines etc.), injection providers, supervisors of the staff responsible for administering injections, waste handlers, waste sorting, healthcare recipient (Patients who will receive injection in the study facilities.

B Data collection

Upon sampling, data collectors were trained and briefed on data collection procedures. The data collection was conducted in both the dry and wet season for a period of five consecutive days during weekly hours of operation by direct observation. Well-structured and designed color-coded waste containers were used to collect waste under standardized conditions. The Color Codes were; Black For General Wastes, Yellow For Infectious Wastes, red for pathological wastes and brown for pharmaceutical healthcare wastes. Also, collection was ordered in such a way to take cognizance of the individual generation points in the hospital.

Quantity of waste were estimated by weighing medical waste from all departments of the study hospitals using a calibrated sensitive weight scale.

C Research Design

This study adopts survey research design to study the Generation and composition of Medical waste management in Lafia. According to Nworgu (2006), survey research design insurance that a group of people or items is studied by collecting analyzed data from only a few people or items considered to be representative of the entire group. Questionnaire were used to determine the opinions, preferences, attitudes and perceptions of people about issues that concern them. As in this study this parameter were used.

D Sampling and Sampling Size

In sampling, quantitative sampling techniques is adopted under which a simple random techniques were considered suitable for the study. The Yaro Yamane formula below were used to determine the sample size at 0.05 confidence level (level of significance).

The sample size was obtained using formula below:

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

Where:

n = expected questionnaire

N = Target population

1 = constant

e = level of significance.

Now, having; n =? 1 = constant, N = 150, and e = 0.05

We have:

$$N = \frac{150}{1 + 150(0.05)^2},$$

Therefore , n = 109.09

Approximately 109 questionnaires are admitted to the 5 health facilities at random order. In other to have equal distribution the researcher used the calculation to get the expected questionnaire per facility. In order to avoid insufficiency in quantity or questionnaire 16 more questionnaires were added to the calculated 109 questionnaires making it a total of 125 questionnaire distributed.

$$\text{Expected number of questionnaire} = \frac{\text{calculated number of questionnaire}}{\text{Number of areas}}$$

Expected number of questionnaire= 125 = 25

5

Having the above result, the expected number of questionnaires distributed is 25 each questionnaire to five facilities.

E. Results and Discussion

The data are presented in tables and the analysis is done using t-Test. The PC method was used in the validation of the hypothesis, where in it's based on the aims and objective of the project. The data imputed from 74 respondents who submitted the question after careful response to the question, the respondents per variable which is the questions are noted by frequency or percentage over 100%. Out of 100 questionnaires given out, 8 is confirmed invalid, among which 12 was not returned and 6 was not properly filled. Hence 74 is used for the analysis, interpretations, and conclusion. Note that the actual intended number of questionnaires to be distributed was 125, a total of 100 was finally used for the study, giving a percentage validity of 80% which is above significant level for the research work.

The Null hypothesis attempt to compare the differences that exist between the color codes of waste and other healthcare waste management practices. The principal components analysis and ANOVA (Analysis of Variance) was used to determine the correlation between the current healthcare waste practices in the five health facilities in the study area shown in the Table 3.1.2 below.

TABLE 3.1.2 SUMMARY OF ANALYSIS OF VARIANCE TEST MEAN VALUE OF GENERATION AND COMPOSITION OF WASTE

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
BLACK * FACILITY	Between Groups	(Combined)	2745.620	1	2745.620	33.346	.000
	Within Groups		31370.765	381	82.338		
	Total		34116.385	382			
RED * FACILITY	Between Groups	(Combined)	773.287	1	773.287	32.982	.000
	Within Groups		7408.828	316	23.446		
	Total		8182.116	317			
YELLOW * FACILITY	Between Groups	(Combined)	700.408	1	700.408	23.283	.000
	Within Groups		9084.815	302	30.082		
	Total		9785.223	303			
SHARPS * FACILITY	Between Groups	(Combined)	198.506	1	198.506	28.180	.000
	Within Groups		1944.234	276	7.044		
	Total		2142.740	277			

F. Findings

i. The findings in respect of the hypothesis revealed that the level of awareness of waste generation and composition is neither low nor high, about 66(89.2%) respondents identify this waste collected by Colour coding.

ii. The study showed little or no evidence of training and re-training of the waste handlers, it also revealed that most facilities agreed that waste are coded using different colors but dump in the same location.

iii. The level of waste minimization at tertiary health facilities in Lafia is extremely poor and does not exist. Even though the HCFs adopt minimal recycling, reuse or reduction, this is not done on a regular basis.

iv. Finding on the Segregation of medical waste in the study area revealed that 67(90.5%) do not agreed to be separating Sharps from non-Sharps, 3(4.1%) agree to segregating Sharps and non-Sharps waste, while 4(5.4%) don't know if Sharps are segregated from non-Sharps.

v. The present system of medical waste management in lafiya is environmentally ineffective, in efficient and hazardous to health. No proper segregation has been practiced in the medical facilities. It was observed that all medical waste in the studied facilities is non-hazardous and may be treated as general waste.

vi. Due to lack of proper segregation, this large portion of non-hazardous waste is unnecessarily polluted by hazardous waste besides, there is no separate collection bin for medical waste and all kinds of waste from medicals including clinical and sharp waste; is dumped in the municipal waste collection bins.

vii. Segregation is the essence of waste management and should be done at source of generation of Bio-medical waste such as: all patient care activity areas, diagnostic services areas, operation theatres, Labour rooms, treatment rooms etc.

viii. The responsibility of segregation should be the generators of Bio- medical waste i.e. Doctors, Nurses, midwives, technicians etc.

ix. Another finding from this research is that. Fifty 50 (67.57%) of the medical facilities dispose of their waste daily. They don't allow their waste to accumulate within their facility for over 24 hours before evacuation. There are different types of vehicles used for waste evacuation but the most common ones' use are open tippers and collection of waste is done manually with shovels and rakes.

x. Many researchers have established that; adequate understanding of waste composition is very important in the provision of efficient management [7, 28, 26, 35, 36, 41, 72]. Notably [26] maintained that a sound understanding of the contents of the waste stream, in particular the contents of the general (non risk) fraction of the waste, is useful for the development of realistic waste minimization and recycling programmes.

xi. Remarkably, substantial efforts have been devoted to research on medical waste in the country. The synopsis of these studies is an indication of poor practices and non/partial compliance with the standardized globally acceptable MWM practices in different parts of Nigeria. At present, research on MWM in varying forms is still ongoing in different parts of the country, however at the time of this research no study has been conducted to evaluate the medical waste generation and composition of Lafia, a fast developing town.

Conclusion

The survey result reveal that while several medical personnel in Lafia health facilities locally understand the need to have a clean environment as well as the challenges that might occur if the opposite were the case, the storage, collection and final disposal of waste is overwhelming the authorities of Nassarawa State. Steady increase in waste variety and quantity coupled with highly in efficient and in effective solid waste management system in Lafia evidenced by waste dumps in drains and public spaces has established the need for improvement. Despite environmental agencies, the deterioration of the urban environments remains a challenge to the communities especially the Local Government that are constitutionally responsible for managing the waste. the system is based on temporary storage within health facilities / household and /or communal dump site' collection and transportation to final disposal site for open burning and open dumping.

Recommendations

The following recommendations are hereby made:

There is need for the public / private hospital to have a Waste Management Department saddled with the responsibility of strict monitoring of the amount and type/ nature of medical waste resulting from daily operations. This is to adequately plan for the waste management either by on-site disposal facility or establishing collaboration with private hospital for the purpose of disposal Waste sorting at source coupled with pre-treatment before disposal should be enforced by the management of public hospitals so as to prevent health risks to the waste handlers and the public at large. A medical waste management policy should be formulated separately from a hospital waste management policy. This can be done by a multidisciplinary team including Environmental Health experts and waste management experts. All staff and personnel handling medical waste in each hospital should be trained and re-trained on methods and new techniques of medical waste management.

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