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Research Paper

Survey Of The Current Solid Waste Disposal Practice In University Of Maiduguri Teaching Hospital

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ABSTRACT: Solid waste is a waste that is not free flowing, such as discarded solid material from the municipal, industrial and agricultural activities. Hospital Waste are Biomedical waste and are generally classified as Hazardous and Non-hazardous, derived from the Hospitals, clinics, Research Laboratories, drug companies' . This study aim to examines data on the hospital waste generated, collection system, process or form of treatment, transportation and disposal. Analysis revealed the general surgery department has the highest number of waste generated on daily basis (3-4 times). Biomedical wastes disposal were found to be subjected to chemical treatment, open dumping and secured landfill which is safe and environmental-friendly. Most of anatomical and pathogenic wastes are disposed by relatives base on religious believes. The study concludes by recommending a wide range of measures to improve the current waste disposal practices in the hospital to ensure sustainable method and practice of waste disposal.

Keywords: Solid waste, Disposal practices, Teaching hospital, Maiduguri.

I. INTRODUCTION

Medical establishment plays a vital role through the use of modern technology to restore and maintain community health. Medical establishments include hospitals, clinics, medical centre, private practices, home health care, blood banks, veterinary offices, clinical facilities, research laboratories, clinical laboratories and all unlicensed and licensed medical facilities (Labib et al, 2005). Hospital solid waste is "any solid waste that is generated in the diagnosis, treatment, or immunization of human being or animals and includes discarded surgical gloves and instruments, needles, lancets cultures, stocks and swabs used to innoculate cultures and removed body organs (WHO, 2000). Health-care waste consist mainly of pathological, infectious, chemical, pharmaceutical, and domestic waste as well as sharps that have been contaminated with blood, infectious agents, tissues, organs (Alagoz and Kocasoy, 2008).

Globally, about 5.2 million people (including 4 million children) die each year from waste-related disease (Akter, 2000). The waste generated from hospitals is now recognized as a serious problem that may have detrimental effects on both the environment and human beings direct or indirect contact. Exposure to hazardous health care waste can result in disease or injury (WHO, 1999). Disease like typhoid, cholera, acquired immune deficiency syndrome (AIDS), and viral hepatitis B can be transmitted through the mismanagement of hazardous hospital waste (Mato and Kassenga, 1997). The nuisance of solid waste management may also lead to foul odour, flies, cockroaches, rodents and vermin as well contamination of underground water table by untreated medical waste in landfills (Nemathaga et al., 2008). In developed countries, legislation and good practice guidelines for medical waste informs the various possible ways for collection, transport, storage and disposal of the wastes. The best available technology is used for the development of alternatives for proper disposal of medical waste with minimal risks to human health and the environment (Tudor et al., 2005). Generally there is no single disposal practice as a solution to the problems of managing hospital waste. In most cases, a number of practices including landfills, incineration, autoclaving and recycling are used in combination. Each practice has its own weakness and strengths (Nemathnga et al., 2008).

In some countries, hazardous and medical waste are still handled and disposed off together with domestic wastes, thus creating high health risks to the municipal workers, the public and the environment (Silva

et al, 2005). In developing countries, waste disposal options are limited, and small scale incinerators have been used as an interim solution. The handling, segregation, mutilation, disinfection, storage, transportation and final disposal are vital steps for safe and scientific management of biomedical waste in any establishment. Because biomedical waste management is a special case wherein, the hazards and risk exist not just for the operators and generators but also for the general community (Singh, 2003). The most appropriate way of identifying the categories of biomedical waste is by sorting into colour coded plastic bags or container (Table 1). The focus of concern is on infectious wastes and on their proper treatment and disposal. Potential infectious wastes and potential toxic wastes are classified as wastes that require special handling. This paper examine ways of waste disposal practices in the Teaching Hospital Maiduguri and the objectives are:

i. To know the types of waste generated in a typical hospital.
ii. To enlighten the general public on the management of biomedical waste in University of Maiduguri Teaching Hospital.
iii. To provide data which could be used to improve future engineering design of waste disposal facilities?
iv. To ensure that hospital waste treatments have no unacceptable effects on the environment.

Table 1: Colour coding-biomedical waste (management and handling) rules, 1998 (schedule II)

Colour coding	Types of container	Waste categories
Yellow	Plastic bags	Category 1: Human anatomical Waste, Category 2: Animal waste, Category 3: Microbiology waste from pathological lab. Category 6: Soiled waste i.e. items contaminated with blood and body fluids
Red	Disinfected container Plastic bags	Category 3: Microbiological Category 6: Soiled waste Category 7: Solid waste (waste IV tubes) (catheter, e.t.c
Blue/white translucent	Plastic bag/puncture proof containers.	Category 4: Waste sharps Category 7:
Black	Plastic bag/Puncture Proof Containers.	Plastic disposal tubings. e.t.c Category 5: Discarded medicines Category 9: Incineration ash Category 10: Chemical waste.

***Source*: MJAFI,(2004)**

Table 2: Types of Hazardous and Highly Hazardous medical waste

Hazardous waste		**Highly hazardous waste**	
Infectious	Wastes thought to contain low concentrations of infectious agents, such as disease causing bacteria, venires, parasites, and fungi, that could spread the disease	Sharps	Sharps objective that can easily cut or injure a handler. Used hypodemic needles are the most common and dangerous, as they are often contaminated with highly infectious blood. Example: syringe needle scalpels, knives, infusion sets, broken glass

Pathological	Tissue or body fluids from humans or animals without highly infectious diseases Example: blood body parts, organs, animal carcasses.	Highly infectious (non-sharp)	Contain high concentrations of highly infectious agents and pose an extreme health hazard Example: body fluids such as blood from patients with highly infectious disease, microbial cultures and carcasses of inoculated laboratory animals
Chemical (in small quantities)	Waste containing purified chemical substances that are toxic, corrosive, flammable reactive and /or explosive Example: unwanted disinfectants solvents film development laboratory reagents.	Chemical and pharmaceutical (in large quantities	The same pharmaceuticals and chemical that are only hazardous in small quantities may be highly hazardous in large quantities Examples: some rechargeable batteries, mercury from broken thermometer or blood pressure gauge some medical equipment batteries.
Pharmaceutical (small quantities	Waste containing pharmaceutical example : unwanted predications	Genotoxic	Waste containing substance which can cause mutations, birth defects and cancer. Facilities with laboratory facilities might stock chemicals Example: chemotherapy drugs
Pressurized container	As cylinders, gas cartridges aerosol cans	Radioactive	Waste containing radioactive substances Example: some laboratory wastes, wastes associated with radiation therapy not likely to be used by health care facilities

Source: 8-3 EGSSAA part ii Chapter 8 Health Wastes, 2009

In Nigeria, Health care solid wastes have not been given the deserving attention and concern. Biomedical waste as a component of municipal or domestic waste which is intended to control nosocomial infectious among patients, nursing staff and other hospital personnel has not been properly addressed. However, Sangodoyin and Coker (2005) suggested the need to initiate a study, which will provide knowledge of the components, characteristics and quantity of the health care waste being generated in Nigeria as a basis for implementation of sound disposal practices.

II. METHODOLOGY

Study area

The University of Maiduguri Teaching Hospital was established in 1988 expanding to about 5000 bed hospital and medical research centre in Maiduguri, (Nigeria). It has basically specialties centre including general medicine, general surgery, orthopedics, ear nose and throat (ENT), obstetrics and gynecology, pediatrics. In addition, the hospital offers a super-specialty service in the kidney centre. The clinical services are comprehensively supported by diagnostic and support facilities like magnetic imaging resonance (MRI) machines and other scientific based technology equipment.

Methods of data collection

The data of biomedical waste were collected from the hospital from each of the units and wards where solid wastes are generated from the disposable bags and containers provided for each units and wards depending on the expected rate of waste generation in that units and wards (plates 1-3). Following 8 hourly collection, the waste samples were sorted into different components and weighed.

Plate 1: Commonly used container for disposing waste in University of Maiduguri Teaching Hospital.

Plate 2: Mode of transportation of Hospital waste

Plate 3: On-site storage in University of Maiduguri Teaching Hospital of Health Care facility

However, estimating the quantity of the waste generated often is a difficult task. In practice, relative mathematical equation have produced different result for each hospital's waste production as it all depends on the hospitals capacity, the number of medical staffs and the applied practice. Therefore an on-site evaluation of the hospital waste generated is considered for examining waste problem to proffer solution.

III. RESULTS AND DISCUSSION

Waste (glassware, plastic material dressing kits, surgical kits and other disposables) were observed to be minimized by recycling and reusable of items subject to proper cleaning and disinfection. Surgical department showed high rates of waste generation per day (table 3). The staff handling infectious waste, were limited to the rooms of patients with highly infectious disease to minimize exposure of infectious waste. The segregation of various types of waste into their different categories according to their treatment/disposal option was done at the point of generation in colour coded plastic bags and containers, to Protect waste handlers and the public from possible injury and disease that could result from exposure to the waste and Avoid attraction to rodents and vermin. Hospital solid waste were observed to be collected in an open dumping site within the Hospital premises and burnt openly (plates 2 and 3). However, this method may constitute public health risk to the people as well requires caution, as contamination of ground water source in the area through leachate However, religious belief and traditions help in reducing the volume of waste as human anatomical and pathogenic wastes are subjected to deep burial in secured landfills as required by patients and relatives. Sorting of waste at source of generation with pretreatment before disposal is the best option.

Table 3: Data on waste bags per Department at UNIMAID Teaching Hospital

Department	Number of red bag	Number of black bags	Number of collection frequency
Pathology department			
Male	1	5	3
Female	2	10	3
Midwifery Department			
Nephrology	1	3	3
Pediatrics	2	5	2
Pulmonary	1	5	2-3
Cardiology	1	10	2-3
Oncology	_	-	-
Hematology	_	-	-
Neurology	_	-	-
Surgical unit			
Surgery department			
Male	2	10	3
Female	3	20	3-4
Neurosurgery	-	-	-
General surgery	10	30	3-4
Anesthesiology	-	-	-
Orthopedics	5	10	3-4
Urology	1	5	3-4
Special units			
Kidney unit	2	5	2-3
Intensive care unit	2	5	2-3
Laboratory units			
x-ray departments	2	(not recorded)	2-3
Hematology	2	3-4	-
Microbiology	1	4	3-4
Biochemistry	-	-	-
Anatomic pathology department	10	20	3-4

NOTE: Dash implies no available records.

IV. CONCLUSION

The study revealed that little or no attention is currently given to management of solid waste in University of Maiduguri Teaching Hospital. No adequate record of waste generation on daily basis, needed for planning future sound health care waste disposal system were kept. The disposal option is open dump and burial in secured landfill which is safe and environmental friendly

Recommendation

The following recommendation would improve solid waste management in the Health Care facility under consideration.

i. Periodic emphases to administrative and maintenance staff who are directly or indirectly involved with waste management is important.
ii. Compulsory inducting training programme should be conducted for staff involved in waste handling to create awareness and efficient handling and management of biomedical waste.
iii. Record should be kept regarding quantities and category of all waste generated on daily, weekly, monthly and yearly basis.
iv. Sorting of waste at source, using separate color-coded containers for various component of health care waste coupled with pretreatment before disposal should be adopted by each health care facilitators.

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