Universal Journal of Education and General Studies (ISSN: 2277-0984) Vol. 1(9) pp. 290-297, September, 2012
Available online http://www.universalresearchjournals.org/ujegs

Full Length Research Paper

Appraisal of university teaching hospital medical waste management in Nigeria: Case Studies of University College Hospital (UCH) Ibadan and Obafemi Awolowo University Teaching Hospital (OAUTH) Ile-Ife.

[1]Toyobo A.E., [2] Baba A.O, [3]Oyeniyi A.B.

[1,3] Department of Urban and Regional Planning
[2] Department of Architecture, LadokeAkintola University of Technology, PMB 4000, Ogbomoso, Oyo State, Nigeria.

Accepted 30 May, 2012

The study appraises the medical waste characteristics and management practices in University College Hospital (UCH), Ibadan and ObafemiAwolowo Teaching Hospital Ile-Ife in Nigeria. It examine characteristic of waste generation, identifies waste disposal methods, assess waste management practices, and possible suggestions towards a healthy environment for patients for the case studies. A total of 164 structure questionnaire were administered using a simple random sampling method to solicit information from respondents. This was further complemented with literature review. Data obtained were analysed using descriptive statistics.The findings revealed improper waste management handling and open dump disposal methods.The study suggests that proper trainings andworkshops should be conducted to make the local resident doctors and waste managementteams in the hospitals aware of the issues and practices of hospital waste management. Beside this theregulation of audit process in this life sensitive issue should be maintained.

Key Words: Medical Waste, Disposal andManagement.

INTRODUCTION

Disposal of medical wastes is a growing environmental concern in the developing world. The problem is growing with an ever-increasing number of hospitals, clinics, and diagnostic laboratories universally (Hassan et al, 2008). Medical waste is infectious and hazardous; posing serious threats to environmental health and requires specific treatment and management prior to its final disposal (Manyele 2004). Until recently, the management of medical wastes has received little attention despite their potential environmental hazards and public health risks. Athough medical waste constitutes a small fraction of the municipal solid waste, the potential environmental and health hazards could be dangerous if not properly handled, the worst scenario being in developing countries (Slack et al., 2004). In recent years, medical waste disposal has posed more difficulties with the appearance of disposable needles, syringes, and other similar items (Askarian et al., 2006). Wastes generated in a hospital are too hazardous to be treated, and carelessness in the management of these wastes tends to spread infections and contaminate the entire living environment prevailing in a hospital (Habibur et al, 1999). However, since the late 1980's, the spreading trend of Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) and other agents associated with blood borne diseases has raised public awareness and concern of the disposition of medical waste. As a result, medical waste is required to be treated in a special way and not to be mixed with municipal waste (Ajadike 2003).

Medical waste contains highly toxic materials, pathogenic viruses and bacteria which could lead to pathological dysfunction of the human body,hospital visitors and patients due to arbitrary management. It is a common phenomenon that poor scavengers, women and children collect some of the medical wastes (e.g. syringe-

*Corresponding author Email: toyoboae@yahoo.co.uk

needles, saline bags, blood bags etc.) for reselling despite the deadly health risks. It has long been known that the re-use of syringes can cause the spread of infections such as AIDS and hepatitis. The collection of disposable medical items (particularly syringes), its re-sale and potential re-use without sterilization could also cause a serious disease burden (Hassan et al, 2008).

The concern regarding medical waste is mainly due to the presence of pathogenic organisms and organic substances in hospital solid wastes in significantly high concentrations. The substantial number of organisms of human *origin* in solid waste suggests the presence of virulent strains of viruses and pathogenic bacteria in undetected numbers. Improper handling of solid waste in the hospital may increase the airborne pathogenic bacteria, which could adversely affect the hospital environment and community at large. Improper medical management has serious impact on human environment. Apart from risk of water, air and soil pollution, it has considerable impact on human health due to aesthetic effects (Slack et al., 2004).The safe disposal and subsequent destruction of medical waste therefore, is a key step to the reduction of illnesses or injuries through contact with this potentially hazardous material, and in the prevention of environmental contamination. The transmission of blood-borne viruses and respiratory, enteric and soft tissue infections through improper medical waste disposal is not well described (Saini et al., 2005).

In 1999, England hospitals acquired infections which cost the health service 1 billion pounds a year, 15 per cent of which were potentially avoidable. The underlying driving forces suggest that this problem got worse. Worldwide there is increasing provision of health care, and an increasing proportion of the population that is immunocompromised (and therefore more susceptible to health care related infection) and without effective action the situation is therefore likely to deteriorate. It is also noteworthy that the level of hospital waste management being practiced worldwide and particularly in the developing countries, does not commensurate with the current rate of increasing establishment of health facilities (Hassan, 2008).

In June 2000, six children were diagnosed to have a *mild* form of *small* pox (viccinia virus) after playing with glass ampoules containing expired small pox vaccine at a garbage dump in Vladivostok, (Blackman 1996). Serious accidents result from radioactive wastes have been documented in Goiania, Brazil in 1988 in which four people died from acute radiation syndrome and twenty-eight suffered serious radiation burns. Similar accidents happened in Mexico City in 1962, Algeria in 1978, Morocco in 1983 and Ciudad Juarez in Mexico in 1983 (Habibur et al., 1999).

In 1987, twelve children in Indianapolis, Indiana played with vials of blood that they found in a trash bin outside a hospital, two of which were infected with AIDS. The Environmental Protection Agency reports that approximately 3.2million tons of medical wastes from hospitals were generated each year, which was about 2% of the total municipal solid waste stream. Currently, most generators of medical waste designate between 10 to 15 percent of it as infectious. Some discarded equipment such as thermometers introduce heavy metals like mercury to water sources that serve human population. Mercury poisoning leads to permanent impairment of the nervous system or death. It also causes sensory loss in limbs, impaired vision and hearing, personality changes and loss of intellectual capacity (Jadhav, 1992).

The general waste is collected in common container in the wards which also contains part of biomedical waste. It is documented, however, that such a practice of non-segregation may increase the costs of final disposal of waste because the infectious and non-infectious wastes get mixed up and hence the wastes that could be disposed of by landfill need incineration and thus increase risks and cost of waste management (Coker et al, 1998). As a result of a lack of waste segregation practices in most hospitals, many of these hazardous materials are flushed down a waste water drain that flows directly to an open sewer or river, are mixed into general solid waste for disposal in municipal bins or are mixed into wastes which are incinerated as potentially infectious waste.

The management of medical waste therefore, should be of major concern due to potentially high risks to human health and the environmentcontext of healthy medical facility will decrease the number of health-care settings associated infections. This study aims at the assessment of hospital waste management practices in University College Hospital (UCH) Ibadan and ObafemiAwolowo University Teaching Hospital (OAUTH) Ile-Ife in Nigeria. The specific objectives of this study are to: (i) examine the characteristics of the solid waste generation in the two teaching hospitals; (ii) identify the waste disposal methods (iii) assess the waste management practices and (iv) offer possible suggestions towards a pleasant and healthy environment for patients and public at large in the study area.

MATERIALS AND METHODS

a. Brief of the study area

The University College Hospital Ibadan and ObafemiAwolowo University Teaching Hospital Ile-Ife are located in the Southwestern Nigeria. The hospitals were established on the premise of training of medical students, staff, research and health care delivery. Each of

the teaching hospitals are made up of departments/units and wards with both skilled and unskilled medical personnel that functions affectively for thegrowth and development. Waste are generated from every segment of the hospital which needs proper management. A combination of purposive and randomly sampling methods was used to select facilities that was visited and two Teaching University Hospitals were selected for detail field study.

b. Methods of data collection

A reconnaissance survey was made to the two teaching hospitals (University College Hospital, Ibadan and ObafemiAwolowo University Teaching Hospital, Ile-Ife), prior the period of data collection for the purpose of familiarization with the hospital system and the existing situation of the waste management practices. Both primary and secondary sources of data were collected in the course of this study. The secondary data were obtained from literature review on documents (printed research theses, journals, books, hospital waste management manuals etc.) which provided background information regarding the establishment of the hospitals, the physical and geographical features as well as the medical operations and services of the two teaching hospitals, nature of hospital waste and management etc. The primary data constituted the relevant information required for the empirical analysis of the study with reference to the two teaching hospitals in particular. These included the identification of the types of waste generated, the waste management procedures of generation, collection, transportation, treatment and disposal, and the management system adopted for each category of waste, and the assessment of the effectiveness of the waste management practices of the two teaching hospitals. A weight measuring scale was used to determine the amount of waste generated per bed/day of hospital patients.

Twenty-seven medical units were identified in each of the teaching hospital and the Environmental Health Department. Three structured questionnaires were distributed in each medical unit to the medical staffs (mainly the nurses), and a questionnaire each to the Environmental Health Department. A total of 164 structured questionnaires were administered using simple random sampling method to solicit information from hospital workers in the study areas.

c. Methods of data analysis

Data were collected from the field and analyzed using descriptive statistic such as frequency count, percentages and tables to affirm the level of waste generation and management in the study areas. Pictures of solid waste characteristics were taken for illustration for the study.

RESULTS

a. Characteristics of solid waste generation in the study areas

Table 1 reveals that paper ranks the highest in solid waste generated 32% (OAUTH) and 25% (UCH)respectively. While cans/tins, used mattress and pillows ranks the least of solid waste generation in the study area. However, waste generated vary in dimension in the two hospitals, the methods of solid waste disposal and management was important for the study. Plates 1 and 2 show the various solid waste characteristics disposed in UCH and OAUTH in Nigeria. On the average hospital waste generated for OAUTH was 1.5-2kg and UCH 1.3-1.5kg waste per bed/day. Out of this 70% of the waste is general waste / garbage which is just like the domestic waste and can be disposed off in municipal bin. 10-15% of the infections waste which include dressing materials, sharps / disposables etc. requires the attention of the health care professionals for proper waste management. Disposal of medical waste in pits and open dumps is detrimental to ground water resources and even more dangerous to surface waters. For example, OAUTH is located right withinOpa water works which serves the entire community of staff, students of ObafemiAwolowo University Ile-Ife should be of great concern. The quantities of medical wastes in thesefacilities are relatively small. However they aremixed at the disposal end. It is generallyrecognized that when non-hazardous waste ismixed with hazardous ones the mixture becomeshazardous, and should be treated as such. It istherefore concluded that solid wastes from thehealthcare facilities needs bettermanagement.Elements of better handling can be viewed to includewaste segregation at source, incineration of pathologicalwaste, properly designed and constructed landfills andtreatment of leachates from the landfills. The technologyfor the design and construction of incinerators, landfillsand other structures is well covered in existing literature.

b. Methods of solid waste disposal in the study areas

Table 2 shows the categories of waste generated and disposal methods. The two teaching hospitalsused incinerators, burial and open dump methods in disposing

Table 1. Characteristics of waste generated in UCH AND OAUTH

Characteristics of solid waste	UCH (%)	OAUTH (%)
Paper	25.0	32.0
Nylon	42.0	30.5
Disposable plates	8.5	10.5
Injection bottles	7.0	5.0
Syringes	12.0	14.0
Bed sheet	1.0	1.0
Blood bag	1.0	2.0
Cans/tins	0.5	0.5
Mattress	0.5	1.0
Pillows	0.5	0.5
Gloves	2.0	3.0

Source: Author's field work, 2010.

Plate 1. Open dump method of solid waste disposal at UCH, Ibadan in Nigeria.
Source: Field survey 2010

Plate 2. Open dump method of solid waste disposal at OAUTH, Ile-Ife in Nigeria
Source: Field survey 2010

solid waste. While open dump method could be dangerous to health, the use of incinerator which is not well located in the vicinity of the hospitals generates air pollution and this could constitute to health risk. Plates 3, 4 and 5 indicates the disposal methods of solid waste generation in UCH and OAUTH. However, as indicated in plates 1, 2 and 3, the material disposed through open dumping in the hospital environment was not hygienic because it could give room to scavengers to trade on such as bottles, needles, cans etc.

Table 2. Disposal techniques for various categories of medical waste

Waste categories	UCH	OAUTH
Sharps	Burial	Incineration
Infectious	Incineration	Incineration
Pathological	Incineration	Burial
Chemical	Incineration	Burial
Pharmaceutical	Incineration	Burial
Radioactive	Incineration	Not applicable
Genotoxic	Incineration	Not applicable
Pressurized container	Burial	Incineration
Others	Incineration	Open dumping

Source: Field work 2010.

Plate 3. Sharps and infectious solid waste separated from the mixed waste at UCH in Ibadan.
Source: Field survey 2010

Plate 4. Waste disposal method at UCH, Ibadan in Nigeria
Source: Field survey 2010

Plate 5. Waste disposal methods at OAUTH, Ile Ife, Nigeria.
Source: Field survey 2010

Table 3. Perception of waste collection methods from respondents in hospital wards in the study area

Time	UCH		OAUTH	
	frequency	**%**	**frequency**	**%**
Twice daily	8	23.52	5	8.06
At the end of each shift	23	67.65	47	75.81
Every two days	2	5.88	4	6.45
Others	1	2.94	6	9.68

Source: Field work, 2010.

Table 4. Personnel responsible for waste collection from the hospital wards

Personnel	UCH		OAUTH	
	frequency	**%**	**frequency**	**%**
Cleaners	7	20.59	9	14.52
Health workers	23	67.65	53	85.498
Hospital maids	3	8.82	0	0.00
Others	1	2.94	0	0.00

Source: Field work, 2009.

Plate 6. Health workers transferring solid waste into the waste collection vehicle at OAUTH Ile-Ife, in Nigeria.
Source: Field survey, 2010.

c. Management ofsolid waste disposal in the study areas

Table 3 shows perception of respondents in waste collection from the hospital wards. Respondents that indicated that at the end of each shift solid waste were collected from wards ranked the highest for (OAUTH)75.81% and (UCH) 67.65% respectively.Sanitation of hospital wards through constant cleaning promote good health of patients and hygiene.

Table 4 revealspersonnels involved in daily cleaning of solid waste in the hospitals. Health workers ranked the highest for (OAUTH) 85.498% and (UCH) 67.65% respectively. Majority of the cleaners are married men and women for (UCH) 20.59%and (OAUTH) 14.52%. They are mostly involved in sweeping and moping hospital wards. Other workers are involved in cutting grasses, and other sanitation activities in the two teaching hospitals.Plates 6 shows effort of hospital health workers in solid waste collection and transportation to the final dumping ground.

Table 5 reveals waste management practices in the two case studies which is tantamount to what exist in developed or developing world.It further shows that the two teaching hospitals have both waste management team and plan and that waste segregation is being practiced to a certain extent and this cannot be over emphazed. However, waste segregation in UCH is carried out at the temporary waste storage site while the same is carried out at the point of generation in OAUTH.

Table 5. Waste management practices in the two teaching hospitals

Variables	UCH	OAUTH
Waste management plan	Present	Present
Waste management team	Present	Present
Waste segregation practice	Present	Present
Place of waste segregation	Temporary storage site	Point of generation
Temporary waste storage facility	Present	Present
Location of the temporary waste storage facility	At the incineration site	At the incineration site
Length of stay of waste at the temporary waste storage site	48hrs	12hrs
Waste pre-treatment	Practiced	Practiced
Perceived sufficiency of waste	Insufficient	Insufficient
Number of incinerator	One	Two
Commonest method of waste disposal	Burning	Burning

Source: Field work, 2010.

This implies that waste segregation practice in OAUTH is more efficient than in UCH. Furthermore, the maximum length of stay of waste at temporary waste storage site in UCH and OAUTH are 48hours and 12hours respectively. Wastes are also pre-treated in both hospitals. Findings from hospital workers revealed that both theTeaching Hospitals suffer from insufficient waste management staff and disposal system. UCH has one functioning manual incinerator while OAUTH has two.The commonest method of waste disposal in both UCH and OAUTH is burning. No matter the type of management practices, implementation and finance is very significant. Despites the various practices as stated, solid wasteis not properly managed which require immediate attention in the case studiesvis-a-vis the sustainability of the waste management plan.

DISCUSSION

Results of findings of oral interview from health workersrevealed a partial medical waste training, monitoring and testing programs in the two teaching hospitals. Burial and incineration methods of medical waste generated were practiced. Unfortunately, infectious medical waste were not excluded from this practice and the daily operation methods of collecting waste generated needs proper caution.The University Teaching Hospital (UCH) employed the service of private waste collector for medical waste collection and final disposal at government authorized dumps site while ObafemiAwolowo University Teaching Hospital (OAUTH) manages her waste employing the services of the Health workers of the hospital. The major challenges to the environment are open dumping within the hospital premises or at government authorized dumpsites, and non-treatment of infectious waste before final disposal. It was also discovered that the dump site at OAUTH is not fenced which gives scavengers the opportunity of scavenged the wastes. This is indeed very dangerous to health.

Recommendations

The following recommendations are advance based on the research findings:

1. Government should support the hospitals with modern waste disposal systems and equipment.
2. Employment of more health workers for day - to - day cleaning of the hospitals.
3. Government should enforce the preparation and implementation of institutional waste management plan in the hospitals.
4. Training of more hospital health workers through attending conferences, seminars and workshops in order to increase their knowledge about hospital waste, its risks and sanitation.
5. Government should enforce environmental sanitation by employing more health workers, and support them with materials and equipment for the day-to-day operation in environmental cleaning exercise in the state.
6 In addition to incineratorsof waste disposal disposition method in the case, The use of incinerators, landfills, aerobic lagoons, and re ed beds are recommended.

ACKNOWLEDGEMENTS

The authors hereby acknowledge the cooperation received from the medical staff ofUniversity College Hospital (UCH) Ibadan and ObafemiAwolowo University Teaching Hospital (OAUTH) Ile-Ife. Willingness of staff of the hospitals to provide information necessary for the research and considerto pursue the full implementation

of waste disposal management plan idea is acknowledged and appreciated.

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