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Hospital waste management in El-Beheira Governorate, Egypt

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ABSTRACT

This study investigated the hospital waste management practices used by eight randomly selected hospitals located in Damanhour City of El-Beheira Governorate and determined the total daily generation rate of their wastes. Physico-chemical characteristics of hospital wastes were determined according to standard methods. A survey was conducted using a questionnaire to collect information about the practices related to waste segregation, collection procedures, the type of temporary storage containers, on-site transport and central storage area, treatment of wastes, off-site transport, and final disposal options. This study indicated that the quantity of medical waste generated by these hospitals was 1.249 tons/day. Almost two-thirds was waste similar to domestic waste. The remainder (38.9%) was considered to be hazardous waste. The survey results showed that segregation of all wastes was not conducted according to consistent rules and standards where some quantity of medical waste was disposed of with domestic wastes. The most frequently used treatment method for solid medical waste was incineration which is not accepted at the current time due to the risks associated with it. Only one of the hospitals was equipped with an incinerator which is devoid of any air pollution control system. Autoclaving was also used in only one of the selected hospitals. As for the liquid medical waste, the survey results indicated that nearly all of the surveyed hospitals were discharging it in the municipal sewerage system without any treatment. It was concluded that the inadequacies in the current hospital waste management practices in Damanhour City were mainly related to ineffective segregation at the source, inappropriate collection methods, unsafe storage of waste, insufficient financial and human resources for proper management, and poor control of waste disposal. The other issues that need to be considered are a lack of appropriate protective equipment and lack of training and clear lines of responsibilities between the departments involved in hospital waste management. Effective medical waste management programs are multisectoral and require cooperation between all levels of implementation, from national and local governments to hospital staff and private businesses.

1. Introduction

Medical establishments play important roles in different activities by the use of modern technology to restore and maintain community health through different departments in the establishment and its firms. Medical establishments include hospitals, clinics, medical centres, 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).

The World Health Organization (WHO), (2000) defines hospital solid waste as "*any solid waste that is generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or testing of biological, including but not limited to: soiled or blood-soaked bandages, culture dishes and other glassware*". It also includes discarded surgical gloves and instruments, needles, lancets, cultures, stocks and swabs used to inoculate cultures and removed body organs.

Health-care waste consists primarily of pathological, infectious, chemical, pharmaceutical, and domestic wastes as well as sharps that have been contaminated with blood, infectious agents, tissues, organs, etc (Alagöz and Kocasoy, 2008). More than 75% of these wastes have been generated from the Egyptian hospitals while the rest of them have been generated from other small health-care institutions (Helwa, 1998).

Globally, about 5.2 million people (including 4 million children) die each year from waste-related diseases (Akter, 2000). The waste generated from hospitals is now recognized as a serious problem that may have detrimental effects either on the environment or on human beings through direct or indirect contact. Exposure to hazardous health care waste can result in disease or injury (WHO, 1999). Diseases like typhoid, cholera, acquired immunodeficiency syndrome (AIDS), and viral hepatitis B can be transmitted through

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the mismanagement of hazardous hospital waste (Mato and Kassenga, 1997). Environmental nuisance may also arise due to foul odour, flies, cockroaches, rodents, and vermin as well as contamination of underground water tables by untreated medical waste in landfills (Nemathaga et al., 2008).

There is growing awareness worldwide of the need to impose stricter controls on the handling and disposal of wastes generated by health care facilities (DEFRA, 2005). In developed countries, legislation and good practice guidelines define medical wastes and state the various possible ways for collection, transport, storage and disposal of such wastes. Also, the best available technologies are used for the development of alternatives for proper disposal of medical wastes 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, so in most cases, a number of practices include landfills, incineration, autoclaving, and recycling are used in combination. Each practice has its own weaknesses and strengths (Nemathaga et al., 2008). However, in developing countries, medical wastes have not received sufficient attention. In many countries, hazardous and medical wastes are still handled and disposed off together with domestic wastes, thus creating a great health risk to municipal workers, the public, and the environment (Silva et al., 2005). In other developing countries, waste disposal options are limited, and small-scale incinerators have been used as an interim solution.

Like many developing countries, Egypt strives to enhance its hospital waste management and achieve good management. Although decree No. 338/1995 and No. 1741/2005 of Environmental Law No.4 (1994) has issued to systematize integrated hospital waste management implementation, authorities are failing to install efficient system with respect to segregation, collection, transfer or treatment due to weakness of legislative enforcement. In addition, various difficulties are being faced at many governorates for implementation of integrated hospital waste management requirements in practice. A number of obstructions are being confronted in El-Beheira Governorate such as inadequate provision of budget allocation, lack of awareness and training about integrated hospital waste management system, etc. Lack of the governmental records and studies regarding waste quantities, characteristics and categorization in health care institutions of El-Beheira Governorate are also limiting factors to identify the existing management shortcomings. Therefore, this study was conducted to carry out an environmental health survey of medical establishments located in El-Beheira Governorate. Field visits were conducted to assess the current medical waste management practices used by hospitals in Damanhour City, to determine quantities of wastes generated as well as to investigate physical and chemical characteristics of wastes in order to recommend the appropriate waste management practices.

2. Background information

El-Beheira Governorate is one of the largest governates in Egypt, located in the west of the Nile Delta of the Rosetta branch. It covers an area of about 9122,84 km^2, and a population of about 4,999,462 million with an annual growth rate of 2.1%; 81.4% of them are living in rural areas (HAD, 2007; UNDP, 2006). It consists of 15 cities, 15 centres, 84 local units village, 491 main villages and 11 corporate, 10 chiefdoms, and 5980 manors (UNDP, 2006). Among cities, only Damanhour is the capital city which covers an area of about 391,42 km^2 representing 4.3% of total El-Beheira area and subdivided into 7 local units village, 57 main villages, and 824 Ezbas (UNDP, 2006). It has the highest population density of about 743,450 comprising 262,125 urban and 481,325 rural that is representing 14.8% of El-Beheira inhabitants (HAD, 2007; UNDP, 2006).

2.1. Waste quantities

In some Egypt's governorates, the quantities of medical waste generated in hospitals have been recorded from different medical services sources as presented in Tables 1–3, (Helwa, 1998).

3. Material and methods

3.1. Study setting and design

Damanhour City was selected for the following reasons:

- It has the only general and teaching hospital (National Medical Institute) with a total number of 590 beds (HAD, 2007).
- It has the highest percentage of El-Beheira public and private hospitals (15.3% and 38.8% respectively) with the highest percentage of different medical services types such as medical staff, beds number, etc (HAD, 2007; UNDP, 2006).

Damanhour's hospitals were stratified to cover the public and private sectors and half (50%) of them (eight) were randomly selected according to the proportional allocation method of sampling (Pedhazur and Schmelkin, 1991).

3.2. Data collection

The data gathered were based upon reviewing the statistical records of El-Beheira Governorate issued each year by the Health Affairs Directorate (2007) and a questionnaire distributed to the eight selected hospitals in Damanhour City. A questionnaire was used to assess the current hospital waste management system in terms of segregation, collection, transportation, treatment, and disposal based on the recommendations from the WHO (1999) and the Egyptian Prime Minister (1994) Executive Decree No. 338/1995 and No. 1741/2005 of Environmental Law No.4.

3.3. Sampling and analysis

The collection of hospital waste samples and quantitative analysis were carried out in 2008. The waste characterization study was carried out in accordance with WHO guidelines (1978). All of the wastes generated in 8 hospitals were weighed on a daily basis, during a period of six months. Unit generation rate in kg/bed/day was calculated by dividing the generation rate in kg/day on the total number of beds in the hospital. Then, in order to determine its physical and chemical characteristics, the waste was separated into different categories according to type of waste such as paper, textiles, plastic, glass, food residues, rubber, metal, etc. and waste categories were weighed again and determined in terms of weight

Table 1
Generation rate of medical waste generated in Cario University hospitals, Egypt.

Medical services source	Generation rate kg/bed/day
Indoor departments	0.50
Outpatient clinics	0.07
Surgical operating	1.20
Intensive care	0.75
Renal dialysis	1.00
Laboratories	0.06
Radiological department	0.40

Source: Helwa (1998).