

# Biochemical Waste Management

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## Abstract

Hospitals generate fluid, gaseous and solid waste, with solids accounting for the bulk of it. The average Kuwait hospital produces waste in the range of 3.8 kg/bed/day. Even though most of the waste is innocuous not medical waste, some is potentially hazardous (e.g., Toxic, infected and blood products).

Biochemical waste disposal is a highly important issue in the world wide especially as the quantities, variety and complexity of these waste materials is increasing significantly. The public and safety authority in The Gulf Cooperation Council (GCC) are concerned over the inappropriate disposal of hazardous waste, its effect on the environment and its possible impact on future generations. Sound waste management of biochemical waste is thus a crucial component of environment health protection.

This study was carried out for a large private hospital as an example of waste management in Kuwait in general. The methodologies, standards and guidelines to perform the work are those developed by Kuwaiti Environment Protection Agency (KEPA) , and the GCC. The output of these will provide ways to protect the people and its environment from the hazards associated with biochemical waste, also to improve awareness, and help to introduce best practices in medical waste management.

**Keywords:** Biochemical waste, hazard, health, medical waste management, safety.

## 1. Introduction

Health care facility such as hospitals, clinics, laboratories, and many other places have to dispose of materials that have been used in medical care or treatment. Hospital waste is a potential health hazard to the health care workers, public and flora and fauna of the area. EPA has defined a waste as hazardous if it has certain properties that could pose danger to human health or the environment after being discarded (Al-Humaidan, S. 2004).

The hazardous nature of the health-care waste may be due to one or more of the following characteristics: (1) it contains infectious agents, (2) genotoxic, (3) contains toxic or hazardous chemicals or pharmaceuticals, (4) radioactive, and (5) contains sharps (Pruss, 1999). Medical waste can typically include: infection,

chemical, biological, pharmaceutical sharps, cytostatic waste, general refuse, and pathological waste. (KEPA, 2001; GCC, 2002).

The Kuwaiti Environmental Public Authorities (KEPA) divided the health waste into two categories: 1) Non-hazardous health care waste. These are produced by all house hold waste such as cleaning works inside health installations. This includes the larger part of total health care waste; 2) Hazardous health care waste. These are produced by contaminated sources or possible contamination by liquid or chemical or radioactive contaminants which are considered hazardous to individuals and society and to the environment during its production, usage, storage or movement or when trying to get rid of it.

The hospital risk management program's, like other hospital functions, requires certain documented plan policies and procedures to ensure program consistency and uniformity.

The plans, policies and procedures are usually in writing, approved and adopted in accordance with established hospital policy and reviewed and revised as necessary. In order to document support for the authority of the hospitals risk management program, policies are adopted by both the governing board and hospital administration ( American Acad. Ortho. Surg. 2004).

This study was carried out for a large private hospital as an example of waste management in Kuwait in general. The methodologies, standards and guidelines to perform the work are those developed by Kuwaiti Environment Protection Agency (KEPA) , and the GCC. The output of these will provide ways to protect the people and its environment from the hazards associated with biochemical waste, also to improve awareness, and help to introduce best practices in medical waste management.

## **2. Questionnaires Methods**

This study was conducted to find out the medical waste management problems in anonymous Hospital which will be referred to at this stage as M.Hospital (MH). The MH hospital waste management will be examined & investigated which include the evaluation of there biochemical waste.

The questions for the survey have been developed to address all the above issues and the employees were targeted to answer the questionnaires that directly or indirectly deal with these issues. Studies by Rutala et al., (1989) and Walker (1991) concluded that medical waste not only comes from hospitals, but also in health centers, doctor's offices or clinics and dentist's.

The main methods of collecting information: questionnaire administered in person and face - to - face interviewing, Visit to relevant offices for distribution and follow up of questionnaires, telephone surveys, and through direct observation.

Total of 396 persons responded to the questionnaires and submitted the completed questionnaire forms. The following occupations were identified and selected for the survey: 1) Doctors; 2) Nurses; 3) Pharmacists; 4) Dentists; 5) Administrative personnel's; 6) Technicians; and 7) Contractor Workers.

### **3. Management and administration**

Heads of each hospital will have to take authorization for generation of waste from appropriate authorities as notified MOH, and EPA well in time. Each hospital should constitute a hospital waste management committee, chaired by the head of a manager and having wide representation from all major departments. This committee should be responsible for making Hospital specific action plan for hospital waste management and its supervision, monitoring and implementation. The annual reports, accident reports, as required under MOH rules should be submitted to the concerned authorities .

Every health installation must have a specific program for managing healthcare waste that includes the identification of the individual responsible for managing the healthcare waste, and how it is to be dealt with and disposed of. There must also be a continuous training program for all workers at the facility (KEPA, 2001). In both the short term and the long term, the actions involved in implementing effective health care waste management programmers required multicultural cooperation and interaction at all levels (Pruss et al., 1999).

The MH hospital has a poor waste management program, lack of certain documented plan policies & procedures to ensure program consistency and uniformity .without a clear term of reference, hidden information, no clear assigned responsibility & no accountability and without specific measurement performance on such committee.

Furthermore Nurses have the highest percentage of awareness about the existing waste policy . Surprisingly doctors come next to the nurses regarding knowledge of hospital waste( Fig.1). As a whole if we compare the responses from all the other professions only 49.9% of the staff is aware with the hospital policy . When the percentage-wise awareness of the MOH's waste-management policy is considered, 90 percent of the dental staff and 90.5 percent of the pharmaceutical staff knew about policies in MOH hospitals. As a whole, only 87.9 percent of the staff was aware of the MOH's policy.

Surprisingly in MH hospital not a single person out of 30 dentist and 58 cleaners knew that such an officer was stationed inside the hospital, and only 5 out of 34 technicians and 2 out of 21 pharmacists knew there was a waste officer in the hospital.

### **3. Classification of Hospital Waste**

It is important to know the correct classification of the hospital waste. The hazardous nature of the health-care waste may be due to one or more of the following characteristics as different types of medical waste pose different dangers depending on their nature :

*-Infectious waste:* The wastes which contain pathogens in sufficient concentration or quantity that could cause diseases. It is hazardous e.g. culture and stocks of infectious agents from laboratories, waste from surgery, waste originating from infectious patients.

-*Pathological waste*: Consists of tissue, organ, body part, human foetuses, blood and body fluid. It is hazardous waste.

-*Pharmaceutical waste*: This includes pharmaceutical products, drugs, and chemicals that have been returned from wards, have been spilled, are outdated, or contaminated.

-*Chemical waste*: This comprises discarded solid, liquid and gaseous chemicals, including cleaning, house keeping, and disinfecting product.

-*Radioactive waste*: It includes solid, liquid, and gaseous waste that is contaminated with radionuclides generated from in-vitro analysis of body tissues and fluid, in-vivo body organ imaging and tumour localization and therapeutic procedures.

-*Sharps*: Waste materials which could cause the person handling it, a cut or puncture of skin e.g. needles, broken glass, saws, nail, blades, scalpels.

-*General waste*: Largely composed of domestic or house hold type waste. It is non-hazardous to human beings, e.g. kitchen waste, packaging material, paper, wrappers, plastics.

The unified medical system of the Gulf Cooperation Council Countries (GCC, 2002), which includes the State of Kuwait, classified hospital waste into eight categories:

Infectious waste.

Pathogenic waste.

Sharp object waste.

Pharmaceutical waste.

Toxic genetic and cellular waste.

Chemical waste.

Radioactive waste.

Pressurized gas containers.

In MH hospital waste was classify into two general groups infection wise :-

-Contaminated waste: This type of waste includes any material soaked or stained with body fluids, e.g., vomit, blood, stool, urine, or sputum, regardless of whether it is known to be infected or not.

-Non-contaminated waste: Waste from offices, waiting areas, and general housekeeping of health care facilities.

#### **4. Risk concept of mixing hazardous waste**

The protection of the public health and the environment must be the ultimate aim of a system for identifying a waste stream as hazardous. An identification process must ensure all waste streams that pose threats to the public health or the environment are sufficiently regulated while not inadvertently regulating waste streams that are not hazardous. Medical waste must be segregated and identify and not be mixed with other wastes as it poses a threat to human health and the environment.

The nursing staffs in MH hospital were more knowledgeable in this context and 50.3% of them knew of the danger, while dental staff remained the least informed with only a mere 6.7% staff knowing of the danger in mixing the wastes.

The key to the minimization and effective management of healthcare waste is segregation and identification of the waste. Appropriate handling, treatment, and disposal of waste by type reduces costs and does much to protect public health. Segregation should always be the responsibility of the waste generator, should take place as close as possible to where the waste is generated, and should be maintained in storage areas and during transport. The same system of segregation should be in force throughout a country. The most appropriate way of identifying the categories of healthcare waste is by sorting the waste into color-coded plastic bags or containers (WHO, 1983).

In M.Hospital the collection & system of segregation is carried by the cleaning laborers in total without supervision. All waste bags are manually tied, however, some bags are loose, These loose bags, even if placed inside the waste containers will cause the collected medical waste to tip out. When trash bags were piled up there is a tendency that it will collapse. Some bags were open with an unpleasant odor and some were found open with all the medical waste spilled out of the compound such as: bandaged materials soaked in drugs, syringes, injection ampoules and chemical test bottles.

Upon inspection of samples of non-hazardous bags, the following medical waste were observed :blood bandages, sharps, gloves, chemical bottles, syringes, including medication pills, covers, and broken medicine bottle thus creating a great health risk to workers, to the public and can affect the environment ( fig.2). Medical waste bags were left behind in the weekend and in the public holidays, exposing them to the rain, wind condition in winter season and at a high temperature condition in summer under direct sunlight, which will then increase the rates of microbial growth and putrefaction.

### **5. Measures for waste minimization**

This reduces waste at the source because the container is not disposed of, and excess material is not disposed or products are repaired or used until worn out. Source reduction also included reducing or eliminating the use of toxic chemicals such as mercury and pesticides, (E.P.A.1990).

Regarding staff knowledge in MH hospital of waste minimization, almost all of the staff indicated that disposal is the only way to minimize waste. Responses concerning recycling and reuse or reduction at the source are minimal. Even doctors showed no knowledge of methods of waste minimization. However, technicians have a good knowledge regarding waste minimization.

The only section that is carrying in MH hospital is the recycling process is the X-ray section. They send the unwanted and disposable x-ray films to some Charity Organizations to extract the silver content from the films which is considered as a very good approach to minimize waste, to protect the environment and save money.

Waste should be prevented at the source as far as possible, purchase of reusable items made of glass and metal should be encouraged As far as possible, purchase of reusable items made of glass and metal should be encouraged. Select non PVC plastic items. Adopt procedures and policies for

proper management of waste generated, the mainstay of which is segregation to reduce the quantity of waste to be treated.

There were no proper segregation in MH hospital observed . furthermore in randomly checked waste bags were many hazardous and non hazardous wastes were observe which been mixed together without preliminary treatment.

## **6. Education and Training**

Training in health and safety should ensure that workers know of and understand the potential risks associated with health care waste (Pruss et al., 1999).

Only nurses in MH hospital showed knowledge on medical waste in the workplace. In general, the rest of the occupational groups indicated very little knowledge on this subject, and cleaners had absolutely no knowledge of it at all.

In practice Nursing Officer Infection in MH hospital carry a mandatory in-service orientation (lectures) on infection control which includes medical waste management to the nurses including the cleaners' supervisor at the beginning of their contract in English language.

The cleaning staff has poor knowledge of basic safety issue in general. The supervisor of the cleaning staff transfer the knowledge of what he understood from the Nursing Infection officer to his cleaning staff including the transfer of the knowledge to the new cleaning staff in contract staff changing period. Most of the existing cleaning staff has intermediate education level.

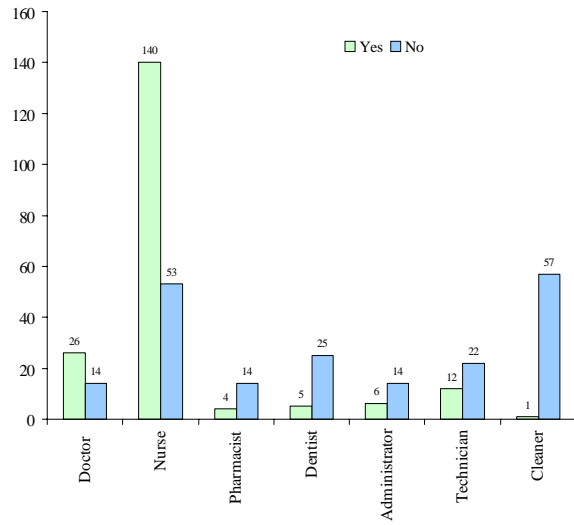
The key aspect for the management of waste is to give appropriate education for all those who come into contact with waste and undergo training for all those who are responsible for handling waste. There was no distribution of booklets, guides, and leaflets describing the risks associated with medical waste management based on legislation, ministry, and EPA recommendation in M.H hospital, for those who directly handle medical waste in their daily work. Good information is essential, particularly for cleaning contractors, or when employees change jobs or work routines, and for substitute or temporary workers. Knowledge must be constantly updated through ongoing discussion and continuing education.

## **7. Conclusions**

It can be concluded that there is no has no comprehensive guide on medical waste management and contractor's health care workers are at risk due to poor knowledge of biochemical waste management.

From the results obtained, it is clear that: there is a need to establish a clear written medical waste management procedure which includes necessary rules, regulations and instructions on different aspect of collection and disposal of waste to authorized disposal site. Hazardous waste should be incorporated in all the hospital policy; health education for all hospital personnel in the form of multi language seminars, pamphlets on waste hazards; encourage studies on different aspects of medical waste, such as the creation of database information in different sectors, risk analysis and disposal methods; store all containers of medical waste in a secure, safe, and adequate location; and assessment of

products used in various hospital activities is important for its safe use and environmental friendly nature (Al-Humaidan, S. 2004).



**Fig 1.** Staff awareness of the hospital's existing waste policy.



**Fig. 2** General waste bags containing hazardous waste

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