

REVIEW ARTICLE

Hospital Waste Management and Environmental Problems in India

S.Mohankumar\*<sup>1</sup> & Dr.K.Kottaiveeran<sup>2</sup>

<sup>1</sup>Department of Economics, Annamalai University, Chidambaram – 608 002, India

<sup>2</sup>Department of Economics, Directorate of Distance Education, Annamalai University, Chidambaram – 608 002, India

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ABSTRACTS

The main purpose of this paper is to give a view of the hospital waste management and environmental problem in India. The objective of this study is to analyze the health care waste management system, including practices and compliances. Most countries of the world, especially the developing countries, are facing the grim situation arising out of environmental pollution due to pathological waste arising from increasing populations and the consequent rapid growth in the number of hospital units. In India, there are about 6 lakhs hospital beds, over 23,000 primary health centers, more than 15,000 small and private hospitals. In India, the Biomedical Waste (Management and Handling) Rules 1998 make it mandatory for hospitals, clinics, and other medical and veterinary institutes to dispose of bio medical wastes strictly according to the rules. The few studies on bio medical waste management from India have established that hospitals did not manage health care waste properly. The hospital waste management sector market revenue (2008) is 8% of the total waste management revenue in India expected growth in next 5-6 years is around 20%. There are many institutions which pollute the environment but recently the ignored field which produce the pollution by way of hospital wastes and attracts the attention of the environmentalists are the hospitals, dispensaries, medical shops, medical clinics of doctors and other paramedical staff. Safe handling, segregation, storage, subsequent destruction and disposal of hospital waste ensure mitigation and minimization of the concerned health risks involved through contact with the potentially hazardous material, and also in the prevention of environmental contamination. Mismanagement of health care waste disposal cause dangerous infection and poses a potential threat to the surrounding environment, persons handling it and to the public. In the past, medical waste was often mixed with household waste and disposed of in municipal solid waste landfills. In recent years, increased public concerns over the improper disposal of health care waste have led to a movement to regulate the waste more systematically and stringently by the Indian government. Waste minimization and recycling are still not well promoted, which results in significant amounts.

**Key words:** Hospital waste, Waste management, Infectious wastes, Non infectious wastes and Waste minimization.

1. INTRODUCTION

Over the past two decades, health care wastes has been identified as one of the major problems that negatively impact both human health and the environment when improperly stored, transported and disposed. For many years, the World Health Organization has advocated that medical waste be regarded as special waste and it is now commonly acknowledged that certain categories of health care waste are among the most hazardous and potentially dangerous of all waste arising in communities. There are many institutions which pollute the environmental but recently the ignored field which produce the pollution by way of health

care wastes and attracts the attention of the environmentalists are the hospitals, dispensaries, medical shops, medical clinics of doctors and other paramedical staff. Hospital waste is defined as any type of waste generated by health care institutions, including hospitals, medical laboratories, animal experimentation units, and clinics.

Hospital waste is not only hazardous and pollute the environment but dangerous for human beings, animals and plants by other ways also. Every day, the countries numerous hospitals and other medical institutions churn out millions of tons of waste. An alarming percentage of

the waste lies on open space creating environmental problems. Health care wastes are hazardous in nature. These damage the environment even at low concentration. Hence it is necessary to take precautionary measures so that hazardous components in the waste are rendered harmless through proper treatment by technology and safe disposal methods.

The problem of health care waste has acquired gargantuan proportion in today's cities. About 1.50 kg of waste was produced per head/per day of the total hospital waste, which was contaminated with disease carry pathogens. If we take an example if a patient lying in the hospital for treatment and a normal man live in the society. A patient in the hospital needs more and more hygienic and pollution free environment. He needs oxygen. But the environment of hospitals, especially of Government hospitals was so polluted by the hospital wastes that it becomes very difficult even for a normal man to go in the hospitals and give a visit to his concerned patient. Most of the hospital they are dumping the hospital waste to open place or municipal solid waste its affect the environmental and human health.

The wastes generated from health care units are generally classified as infectious and non infectious. The infectious health care wastes are termed as hospital wastes and are considered to be potentially hazardous in nature. The disposal of untreated health care wastes mixed with non infectious hospital wastes or other general municipal wastes poses an environmental threat and public health risk. Indiscriminate disposal of untreated health care waste is often the cause for the spread of several infectious diseases. It was also responsible for the nosocomial diseases i.e. the hospital acquired diseases to the health care personnel who handle these wastes at the point of generation. Moreover, this is equally harmful to persons involved in the health care waste management i.e. segregation, storage, transport, treatment and disposal. Apart from the above, a good amount of health care wastes such as disposable syringes, saline bottles, I.V. fluid bottles etc. are picked up by rag pickers and are recycled back into the market without any disinfection. It is imperative, therefore, to adopt an appropriate environmentally safe method for the disposal of the health care wastes.

## 2. TYPES OF HOSPITAL CARE WASTES:

These are of two types, infectious wastes and non infectious wastes

### 2.1 Infectious Hospital Wastes:

- Human anatomical or surgical waste,
- Animal waste
- Pathological waste including tissues, organs, blood and body fluids, microbiological cultures, Cotton, Swabs etc.
- Used Syringes, I.V. tubes, Blood bags and other items contaminated with blood and body fluids.
- Items such as plaster, casts and bandages, when contaminated by blood and pus.
- Waste from isolation wards.

The amount of infectious waste is near about 15 to 20 per cent of the total wastes generated from the health care establishment.

### 2.2 Non Infectious Hospital Waste:

Non infectious waste is broadly classified as kitchen waste and office wastes. It is similar to household waste. Non infectious wastes constitute nearly about 85% to 80% of the total wastes generated from a health care unit. In absence of proper segregation, the non infectious waste becomes infectious and poses environmental threat to the society.

## 3. BIO MEDICAL WASTE MANAGEMENT RULES, 1998 (Amended in 2000 and 2003)

Under the Environmental Protection Act, the bio medical waste management rules were introduced. These rules are directly relevant to the health sector. The salient features of these rules are as follows:

- Bio medical wastes means waste that is generated during the diagnosis, treatment or immunizations of human beings or animals or in research activities pertaining thereto or in the production or testing of biological.
- It is the duty of every occupier of an institution generating bio medical waste which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory and blood bank by whatever name called to take all steps to ensure that such waste is handled without any adverse effect to human health and the environment, policies, legislation and regulations policy framework, March 2007.

## 4. REVIEW OF LITERATURE

In the literature, there are only a few analytical studies closely to health care waste management in India level.

According to Srinivasa Chary (2001) the problems associated with medical waste disposal is

aggravated due to rapid and uncontrolled growth of medical care facilities, increase of waste generation rate owing to marked increase in disposable medical care materials, illegal and unsafe methods of recycling of waste due to increased cost of disposable medical care materials. This situation can cause a potential health hazard to public at large, especially health care workers, municipal employees and rag pickers involved recycling of waste.

Santappa (2002) says that waste handlers and the community that lives in the proximity are at risk of contacting communicable disease arising due to improper handling of hospital wastes. Skin contact, injection and inhalation are possible routes of exposures which could cause chronic effects and acute problem. Containers and plastic materials, likely to be salvaged by scavengers may spread communicable disease in case they are not properly sterilized before recycling or reuse.

Gupta (2006) study observed that the personnel working under the occupier were trained to take adequate precautionary measures in handling these bio hazardous waste materials, the process of segregation, collection, transport, storage and final disposal of infectious waste was done in compliance with the standard procedures, the final disposal was by incineration in accordance to Environment Product Act Rules 1998, the non infectious waste was collected separately in different containers and treated as general waste, and on an average about 520 kg of non infectious and 101 kg of infectious waste is generated per day about 2.31 kg per day per bed, gross weight comprising both infectious and noninfectious waste. This hospital also extends its facility to the neighboring clinics and hospitals by treating their produced waste for incineration.

According to Ministry of Health and Social Welfare (2006) hospital waste management includes all activities involved in waste generation, segregation, transportation, storage, treatment and final disposal of all types of waste generated in the hospital facilities, stages of which require special attention. This will ensure that inputs activities and outputs for the safe handling and disposal of healthcare waste are in place.

### **5. PRESENT SCENARIO OF HOSPITAL WASTES**

In India, hospital wastes generate around 3 million tones every year and the amount is expected to grow at 8.00 per cent annually. Health care wastes if not handled and disposed indiscriminately may cause adverse effects on human health and environment. According to the available

information from the State Pollution Control Boards (2007-08) 52,001 (53.25 %), health care establishments are in operation without obtaining authorization from their respective SPCB/PCC. Approximately 288.20 tons per day (56.87%) out of 506.74 tons per day wastes generated is being treated either through Common Bio Medical Waste Treatment Facilities (159 in number) or captive treatment facilities. There are 602 bio medical waste incinerators (which include both common and captive incinerators), 2218 autoclaves, 192 microwaves, 151 hydroclave and 8,038 shredders in the country. About 424 (70.4%) out of 602 incinerators are provided with air pollution control devices and 178 (29.6 %) incinerators are in operation without air pollution control devices.

### **6. HOSPITAL WASTE MANAGEMENT IN TAMIL NADU**

There are 1405 Private hospitals and 243 Government hospitals in Tamil Nadu. There are about 96,000 hospital beds all over the States. The Chairman, Tamil Nadu Pollution Control Board has been designated as prescribed authority for granting authorization and implementation of the bio medical wastes (management and handling) rules, 1998. Tamil Nadu Pollution Control Board is taking necessary steps for the safe environmental management of hospital wastes and is monitoring the prevailing practices and evaluating various treatment and disposal options for the safe destruction of hospital wastes, considering the aspects of both environmental impact and cost. Common incinerator facilities have been provided in Salem for 58 hospitals and in Madurai for 78 hospitals with a capacity of 50Kg/hr each. Presently 50-55% of bio medical wastes was collected, segregated and treated as per bio medical waste management rules. Rests are dumped with municipal solid wastes.

### **7. CHALLENGES OF HOSPITAL WASTES IN INDIA**

- To treat 420561 kg per day of bio medical waste in accordance with BMW Rules.
- Number of Common Bio Medical Wastes Treatment Facility (CBMWTF) to be increased manifold. Presently there are 157 facilities which are not adequate to handle all the bio medical wastes generated.
- CBMWTF is to be set up under public private partnership mode.
- New technologies to be promoted for destruction of toxic bio medical wastes.

Out of 84,809 health care establishments, 43,075 authorizations have been generated by SPCBs for management of bio medical waste. Out of 420461 kg/day of waste generation, only 24 0682 kg/day of waste is treated. Out of 84,809 hospitals, 48,183 hospital are either using common bio medical waste treatment facilities (which are 170 in Numbers) or have engaged private agencies. There are; 391 incinerators (with APCB), 2562 autoclaves, 458 microwaves, 145 hydroclaves and 6047 shredders in operation. Further, 14,959 hospitals have been served as show cause notices as defaulters. Surveys carried out by various agencies show that the health care establishments in India are not giving due attention to their waste management. After the notification of the Bio medical Waste (Handling and Management) Rules, 1998, hospitals are slowly streamlining the process of waste segregation, collection, treatment, and disposal.

### **8. HOSPITAL WASTE MANAGEMENT AND ENVIRONMENTAL PROBLEM**

The following are the main environmental concerns with respect to improper disposal of health care waste management:

- Spread of infection and disease through vector which affect the in house as well as surrounding population.
- Spread of infection through contact or injury among medical or non medical personnel and sweepers or rag pickers, especially from the sharps.
- Spread of infection through unauthorized recycling of disposable items such as hypodermic needles, tubes, blades, bottles etc. Reaction due to use of discarded medicines.

An important issue of environmental protection process is the waste management that includes responsible planning of collecting, transporting, processing and disposing waste material. The purposes are to clean up the surrounding environment and to see that the waste does not have a detrimental effect on human being health. Within waste management the health care waste management is a process that helps to ensure proper hospital hygiene and safety of health care workers and communities. Hospital waste management concerns about planning and procurement, staff training and behavior, proper use of tools, machines and pharmaceuticals, proper methods applied for segregation, reduction in volume, treatment and disposal of hospital waste.

### **9. HOSPITAL WASTES AND HEALTH PROBLEM**

Within a health care facility the main groups submitted to risks are:

- Doctors, medical nurses, healthcare unit workers and maintenance staff
- Patients
- Visitors
- Workers in ancillary services, laundry, medical supplies store, those charged with collecting and transporting waste
- Service workers dealing with waste treatment and disposal of health unit.

Regarding the health care workers, three infections are most commonly transmitted: Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immune Deficiency Virus (HIV). Among the 35 million health care workers worldwide the estimations show that each year about 3 million receive hard exposures to blood borne pathogens, 2 million of those to HBV, 0.9 million to HCV, and 170,000 to HIV. Also, the workers involved in the collection and treatment of the health care waste are exposed to a certain risk.

### **10. COST OF HOSPITAL WASTE MANAGEMENT**

The economic factors such as investment, cost, pricing, segregation, dumping and disposal along with the management techniques are play a major role while setting up a waste management system. The present health care waste management practices are characterized by poor collection system and services which as improper disposal at open dumping yards. The hospital, hazardous and household wastages are mixed together at site. Thus, this attempt may bring the best system with minimum investment.

The cost of construction, operation and maintenance of system for managing hospital waste represents a significant part of overall budget of a hospital if the bio medical waste handling rules 1998 have to be implemented in their true spirit. Government of India in its pilot project for health care waste management in Government hospitals has estimated Rs.85 lakhs capital cost in 1000 bedded super specialty teaching hospitals which includes on site final disposal of health care wastes. Two types of costs are required to be incurred by hospitals for hospital waste management, internal and external cost. Internal cost is the cost for segregation, mutilation, disinfection, internal storage and transportation including hidden cost of protective

equipment. External cost involves off site transport of waste, treatment and final disposal. Self contained onsite treatment methods may be desirable and feasible for large hospital facilities. They will not be practical or economical for smaller institutes. An acceptable common system should be in place which will provide regular supply of colour coded bags daily collection of infectious waste and safe transportation of waste to offsite treatment facility and final disposal with suitable technology.

## **11. HEALTH CARE WASTE SEGREGATION AND STORAGE**

The segregation of hospital waste should be examined because facility standard operating procedures for hospital waste segregation have a direct impact on type and cost of health care waste treatment. Each category of waste has to be kept segregated in a proper container or bag. Such container or bag should have certain properties it should be without any leakage it must be able to contain the designed volume and weight of the waste without any damage. The container should have a cover preferably operated by foot. When a bag or container is filled at 3/4th capacity it must be sealed and an appropriate label has to be attached. Arrangement for separate receptacles in the storage area with prominent display of colour code has been made in accordance with the legislation yellow for hazardous health care waste and black for the non hazardous waste.

### **11.1 Collection**

- Respective coloured bags should be kept in similar coloured container i.e coloured bags shall not be directly kept in vehicle.
- Sharps shall be collected in puncture resistant containers.
- Temporary storage at healthcare unit shall be designated.

## **12. HOSPITAL WASTES HANDLING AND TRANSPORTATION**

This activity has three components: collection of different kinds of waste from waste storage bags and containers inside the hospital, transportation and intermediate storage of segregated waste inside the premises and transportation of the waste outside the premises towards the treatment or final disposal. The biomedical waste has to be transported to the treatment or disposal facility site in a safe manner. The vehicle should have certain specifications it should be covered and secured against accidental opening of door, leakage etc. The interior of the container without sharp edges or corners in the aim to be easily washed and disinfected there should be adequate

arrangements for drainage and collection of any leakage.

## **13. HOSPITAL WASTE TREATMENT AND DISPOSAL**

Different methods have been developed for rendering biomedical waste environmentally innocuous and aesthetically acceptable. The biomedical waste legislation has elaborately mentioned the recommended treatment and disposal options according to the different categories of waste generated in hospitals. Different methods and treatment technologies have been developed (a) Incineration, (b) Autoclave treatment, (c) Hydroclave treatment, (d) Microwave treatment, (e) Mechanical/Chemical Disinfecting, (f) Sanitary and secured Land filling and (g) General Waste.

## **14. FINDINGS**

The safe management of hospital waste has received much attention over recent years in India. Emphasis is placed mainly on the proper handling, segregation and disposal of the hospital wastes. Waste minimization and recycling are still not well promoted. The main issues considered were the adverse environmental and health impacts that arise from poor handling and disposal practices, the responsible institutions and initiatives taken and the policy framework.

## **15. CONCLUSION**

The proper hospital waste management system can help the control diseases can reduce community exposure to resistant bacteria, and could reduce HIV/AIDS and Hepatitis transmission from dirty needles and other improperly cleaned or disposed medical items. Regarding the environmental issues, a correct and sustainable management system of hospital waste will avoid the negative long term health effects, from the environmental release of toxic substances such as dioxin, mercury and others. From both volume and toxicity perspectives, the use of plastics in society is a focus of waste management concern. In the past, medical waste was often mixed with household waste and disposed of in municipal solid waste landfills. In recent years, increased public concerns over the improper disposal of hospital waste have led to a movement to regulate the waste more systematically and stringently by the Indian Government.

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