Review of Present Status of Bio Medical Waste Management in Pune

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Abstract- *As in any other industry, hospitals also generate waste. However, this waste is different in terms of content.*

Hospitals generate biomedical waste, the handling of which is one of the major concerns of hospitals across the globe, in particular, those of the developing countries. This paper mainly focuses on how biomedical waste is handled, segregated and disposed off by private hospitals in Pune, also discuss about waste management practices in Pune and various issues related to biomedical waste.

Keywords- Bio-Medical Waste; Segregated; Private hospitals; hazardous; disposal Bag

I. INTRODUCTION

The waste generated by hospitals is known as 'biomedical waste'. This waste is different from other waste, because of its hazardous nature. This waste is directly generated from the human body and animals; it is the content more than the quantity which makes medical waste dangerous and risky. Hospitals are considered as emergency services. Because of ever increasing population there is continuous increase in the amount of waste generated by hospitals. This has led to an increase in the use of disposable medical supplies, causing an increase in the quantity of biomedical waste.

During the period of 1980s and 1990s, the exposure to HIV and Hepatitis B virus increased the awareness of biomedical waste. Biomedical waste is risky to the society and the environment and also people who collect, segregate and dispose it. Needles, blades and other sharp instruments that are not disposed of properly or not disinfected can infect them or harm them. Also, the high temperatures and toxic gases released during waste disposal pose a health hazard to the workers. Surprisingly, 80% out of the total quantity of biomedical waste is non-hazardous. Only 15% is harmful or infectious. If bio-medical waste is allowed to mix with municipal solid waste and dumped in the garbage bins meant for other waste, then the entire mass becomes infectious and can pose a potential risk to the nearby residents. If this waste will be disposed of at landfills, the environment will also be harmed. If incinerators are not operated properly, environmental degradation is inevitable. Because of the hazardous nature of biomedical waste and the risks associated with it, the Ministry of Environment and Forests formed the Biomedical Waste (Management and Handling) Rules in 1998.

The Biomedical Waste (Management and Handling) Rules, define various terms including 'biomedical waste', 'occupier' and biomedical waste treatment facility. These include important areas like treatment and disposal, segregation, packaging, transportation and storage of biomedical waste. They clearly state that the government of every state will establish a prescribed authority.

II. OBJECTIVES OF THE STUDY

2.1 To know present status of biomedical waste in Pune city.
2.2 To understand the procedure of disposal of biomedical waste.
2.3 To focus on problems of scientific disposal of biomedical waste.
2.4 To find out methods and strategy adopted by Private Hospitals for discarding bio-medical waste.

2.1Biomedical waste management scenario in Pune city

Currently minimum three tonnes of bio-medical waste is generated daily in Pune and 1.2 tonnes in Pimpri-Chinchwad. All biomedical waste is incinerated at the facilities at Kailash crematorium and at Moshi.

For collection of bio-medical at least 100 clinics will be engaged in an experiment that includes sending missed calls to the service agency to take the trash from their doorsteps.

The Pune Municipal Corporation appointed Passco Environmental Solutions Ltd in 2005 to collect, transport and dispose biomedical waste (BMW) at Kailash crematorium, will now collecting a door-to-door medical waste from the registered clinics on a trial basis.

2.2 The procedure of disposal of biomedical waste

According to (bio-medical waste collection and disposal programme in the PMC) the waste is collected daily from 450 collection points by seven dedicated collection vehicles equipped with electronic weighing and bar code reading facility. Manual interference is compulsory avoided while undertaking these operations. The entire operation is automated.

A total of 614 nursing homes, 284 pathology laboratories, 18 blood banks and 2,826 dispensaries are registered with Passco to dispose bio-medical waste. Passco has a fully-computerized set-up and an interactive website. Doctors can also track its vehicles on their mobile phones or laptops to find our exact location before picking up the waste.

TABLE 1. SOURCES OF BIOMEDICAL WASTE IN PUNE

Sr. No.	Source of biomedical waste	No. of Organizations
1	Nursing Homes	614
2	Blood Bank	18
3	Pathology laboratories	284
4	Dispensaries	2,826

According to Passco officials, the need for introducing the missed call facility was felt after they observed that several doctors did not send bio-medical waste for disposal since the collection points were at a distance from their clinics. At times, there has been a delay as the staff from the clinic does not come to the collection points with the bio-medical waste. So, as an additional facility, Passco is now providing missed call facility to collect the bio-medical waste right at their doorsteps.

On a trial basis, the facility will involve only 100 clinics since Passco has to assess the cost effectiveness of the scheme. For this purpose the city would be divided in 12 areas this is convenient to provide service to the clinics in one particular area on the designated days.

Biomedical waste can lead to serious health and environment problems if not managed properly. This is waste generated during the diagnosis, treatment or immunization of human beings or animals by health care and research facilities. It includes discarded sharps, blood, unwanted microbiological cultures, needles, scalpels and such. Apart from incineration, autoclave method is also used to dispose some of the bio-medical waste.

TYPES OF BIOMEDICAL WASTE AND DISPOSAL BAG COLOUR CODE

Biomedical waste can be divided in to following categories-

Sharps – It includes needles, blades, scalpels and glass which can cause injury. It must be disposed off using cardboard box with white tag.

Plastic- It contains contaminated items like syringes, blood bags, IV bottles, etc. It must be disposed in red bag.

Human Anatomical Waste – It includes human tissue, bandages with blood and pus, soiled cotton and dressings, etc. It must be disposed in yellow bag.

2.3 Problems Relating to Biomedical Waste

In many hospitals is the implementation of Bio-Waste regulation is unsatisfactory as some hospitals are disposing of waste in a haphazard, improper and indiscriminate manner. Lack of segregation practices, results in mixing of hospital wastes with general waste making the whole waste stream hazardous. Inappropriate segregation ultimately results in an incorrect method of waste disposal. Inadequate Bio-Medical waste management is mainly responsible for environmental pollution, unpleasant smell, growth and multiplication of vectors like insects, rodents and worms and may lead to the transmission of diseases like typhoid, cholera, hepatitis and AIDS through injuries from syringes and needles contaminated with human. Various communicable diseases, which spread through water, sweat, blood, body fluids and contaminated organs, are important to be prevented. The Bio Medical Waste scattered in and around the hospitals mainly invites flies, insects, rodents, cats and dogs that are responsible for the spread of communication disease like plague and rabies. Rag pickers in the hospital, sorting out the garbage are at a risk of getting tetanus and HIV infections. The recycling of disposable syringes, needles and other article like glass bottles without proper sterilization are responsible for Hepatitis, HIV, and other viral diseases. It is primary responsibility of Health administrators to manage hospital waste in most safe and eco-friendly manner.

The problem of bio-medical waste disposal in the hospitals and other healthcare establishments has become an issue of increasing concern, prompting hospital administration to seek new alternatives of scientific, safe and cost effective management of the waste, and keeping their personnel informed about the advances in this area. There is a need of proper scientific hospital waste management system which is an essential part of quality assurance in hospitals. Few reasons

are studied which focus to strong need of Bio medical waste management are as follows-

i. Risk of injuries from sharps leading to infection to all categories of hospital personnel and waste handler.
ii. Nosocomial infections in patients due to poor infection control practices and poor waste management.
iii. Risk of infection outside hospital for waste handlers and scavengers and general public living in the vicinity of hospitals.
iv. Risk due to hazardous chemicals, drugs to persons handling wastes at all levels.
v. "Disposable" being repacked and sold through unscrupulous elements without even being washed.
vi. Drugs which have been disposed of and repacked to sale off to unsuspecting
vii. Risk of air, water and soil pollution directly because of waste, defective incineration emissions and ash buyers.

2.4 Bio Medical Waste Management Process

There is a big network of Health Care Institutions in India. The hospital waste like body parts, organs, tissues, blood and body fluids along with soiled linen, cotton, bandage and plaster casts from infected and contaminated areas are very important to be properly collected, segregated, stored, transported, treated and disposed off in safe manner to prevent nosocomial or hospital acquired infection. Following are the Highlights of bio medical waste management process is in six major categories

i. Waste collection
ii. Segregation
iii. Transportation and storage
iv. Treatment & Disposal
v. Transport to final disposal site
vi. Final disposal

III. BIO MEDICAL WASTE TREATMENT & DISPOSAL

Bio medical waste is very difficult to manage as such. The problem can be simplified by using following methods to discard medical waste.

3.1 Incineration Technology

This is a high temperature thermal process employing combustion of the waste under controlled condition for converting them into inert material and gases. Incinerators can be oil fired or electrically powered or a combination thereof. There are three types of incinerators are used for hospital waste: multiple hearth type, rotary kiln and controlled air types

3.2 Non-Incineration Technology

Non-incineration treatment based upon four basic processes: thermal, chemical, irradiative, and biological. The majority of non incineration technologies employ the thermal and chemical processes which decontaminate waste by destroying pathogens.

3.3 Autoclaving

Autoclaving involves using steam at high temperatures. The steam generated at high temperature penetrates waste material and kills the entire micro organism this is a high temperature thermal process employing combustion of the waste under controlled condition for converting them into inert material and gases.

3.4 Microwave Irradiation

The microwave is based on the principle of generation of high frequency waves which cause the particles within the waste material to vibrate, generating heat and kills all pathogens.

3.5 Chemical Methods

Under this method 1 % hypochlorite solution can be used for chemical disinfection

3.6 Plasma Pyrolysis

Plasma Pyrolysis is an environment-friendly technology, which converts organic waste into commercially useful by products. The intense heat generated by the plasma enables it to dispose all types of waste including municipal solid waste, biomedical waste and hazardous waste in a safe and reliable manner. Medical waste is pyrolysed into CO, H2, and hydrocarbons when it comes in contact with the plasma-arc

IV. CURRENT STATUS OF BIO-MEDICAL WASTE IN PUNE-

In Pune, still need to have scientific disposal of the biomedical waste. Only about 45% of biomedical waste generated by the city's clinics is scientifically disposed of according to the latest report put out by the Pune Municipal Corporation.

There are around 6,000 general practitioners who have clinics within the city limits. Of them, only 2,754 have joined the common biomedical waste disposal system till date. This Medical waste, including needles, gauze and blood-soaked cotton swabs from the remaining clinics must be discarded through garbage bins, nullahs and gutters. At present only 592 clinics had newly joined the scientific disposal system till June, this year. A total of 2,162 clinics in the city had opted for the common biomedical waste treatment facility till June 2014.

In Pune healthcare facilities generate around 2,800 kg to 3,000 kg bio-medical waste every day.

PMC has always been aiming for 100% scientific disposal of city's biomedical waste. All the hospitals, pathology labs and blood banks have subscribed to the common biomedical waste treatment facility. But private general practitioners running clinics in city are reluctant to join the facility, as reported by S T Pardeshi, medical officer of health (MoH), Pune Municipal Corporation.

PMC had tried every method to convince and attract the general practitioners to join the common biomedical waste facility. After extensive negotiations, PMC had reduced the annual subscription charges from Rs 2,900 to Rs 2,100, last year. These efforts helped PMC to rope in around 592 clinics in a year.

Family physician Santaji Kadam, former president of General Practitioners' Association, Pune branch reported that, the foremost demand of general practitioners has been the collection of their medical waste from the doorstep. But this demand has not been fulfilled by the PMC. There are some collection spots where the clinic owners have to drop their waste on the fixed days and time which many of clinics find difficult to follow while running the clinic. It is fine even if PMC provide doorstep collection once a week as a clinic's daily generation of medical waste is minimum compared to big hospitals.

Another physician reported around 80% clinics in Pune have needle destroyer electric machines which take care of used needles. But there is sizable number who does not have this facility. Needles disposed by such clinics can cause diseases to garbage handlers, sweepers and even children who play in the open. Clinics normally general waste in the form of dressing material, cotton swabs and gauzes. If these are used for cleaning the blood of person having diseases then disposing them in open can transfer diseases by flies and other vectors. This is definitely dangerous. The Maharashtra Pollution Control Board (MPCB) officials reported they had made an inventory of all hospitals and clinics in and around the city. While a large number of clinics/hospitals have ignored the PMC's instructions, some have not even sought the essential authorization needed from the pollution control board for generating BMW, an MPCB official said.

V. HOW THE CITY FARES

* Over 3,246 clinics in the city that have not yet joined the facility and they may be disposing of their waste in an unscientific and hazardous manner

* Currently Pune's registered healthcare facilities generate around 2,800 kg to 3,000 kg biomedical waste every day which is processed at the common treatment facility in Kailas crematorium

* However, approximately 200 kg of biomedical waste generated by unregistered clinics could be finding its way to the dustbins, nullahs and unfenced plots instead of being disposed of in incinerators

Reasons for Resistance

* Timing of reaching the collection spot for delivery clinic's waste is not suitable for all clinics

* Collection spots demarcated for collecting clinics waste are located at long distances

* Registered clinics are frustrated as they are facing problem of trivial mistakes

Clinics' Expectations

* Must provide door to door collection of waste from every clinic

* Total cost of annual subscription for treating medical waste should not be hiked every year.

Hazards

Proper disposal of biomedical waste is of paramount important because of its infectious and hazardous nature. Unscientific disposal can result in:

*Organic portions of medical waste attract flies
* Injuries from sharp objects to healthcare employees and waste handlers
* Increased risk of infections to medical, nursing and other hospital staff members

* Injuries from infected sharp objects to health workers and waste handling employees
* Increase in risk related with hazardous chemicals and drugs being handled by waste handlers
* Unscrupulous persons can reuse disposable and disposed of drugs for repackaging and reselling
* Development of resistant strains of micro-organisms in medical waste

VI. METHODOLOGY OF THE RESEARCH

In order to understand biomedical waste management in Pune, case studies of three hospitals and the common biomedical treatment facility were carried out. The data obtained was tabulated and an attempt was made to understand the biomedical waste storage, segregation, handling and disposal in the hospitals situated at Sinhgad Road.

The study involved hospitals within the Pune Municipal Corporation (PMC) limits and situated on Sinhgad Road only.

The two old and well established hospitals that were studied had different number of beds were considered. The study attempted to understand, how much waste is generated and how it is managed in hospitals with varying capacity (in terms of beds). The third hospital, which was identified for study was a very recent establishment, where examinations were done to see whether any special provisions with regard to biomedical waste management existed. The staff members who handled the biomedical waste were interviewed to find out the details of the processes followed.

According to the rules prescribed, the duty of the occupier is segregation, packing and daily handing over of the waste. The occupier of any healthcare facility is required to register with the following three bodies:

i) The local authority, which is PMC in Pune
ii) Common Biomedical Waste Treatment Facility (CBWTF), which is Passco in Pune
iii) Maharashtra Pollution Control Board (MPCB)

TABLE 2: DATA FROM THE CASE STUDIES

Hospital	Location	No. of Beds	Private / Govt.	Method of disposal	Main Storage area
1	Anadnagar, Pune	38	Private	Given to CBWTF - Pascco	Stored in a separate room
2	Wadgaon Bk, Pune	20	Private	Given to CBWTF - Pascco	Stored in a separate room
3	Dhayari, Pune	11	Private	Given to CBWTF - Pascco	Stored in a separate room

TABLE 3: HOSPITAL AND QUANTITY OF BIOMEDICAL WASTE

Hospital	No. of Beds	Quantity of Bio-medical waste generated per month
1	38	450 Kg.
2	20	210 Kg.
3	11	150kg. (As This hospital was opened 6 months back, the waste generated is less)

6.1 Biomedical Waste Management in Hospital 1

This is a big hospital with four floors and a capacity of 38 beds. It generates almost 450 kgs. of biomedical waste every month. This waste is segregated at the source itself. This waste is shifted to the garbage room located on the ground floor. All the segregated biomedical waste from all floors is collected in this garbage room. The waste from each floor is then brought to the common storage area located near the main hospital gate within the premises.

This shifting is done when there is fewer crowd, using the common lift. Once in the common storage area, the colour coded waste bags are kept in a closed container. These are later picked up by the Central Biomedical Waste Treatment Facility (CBWTF).

6.2 Biomedical Waste Management in Hospital 2

This hospital is established since 10 years and providing various medical services to local area.

It generates approximately 210 kgs. Medical waste in a month. This waste collected in a separate room and forwarded to CBWTF daily. It also stored medical waste in a separate room at ground floor. No special training was given to employees handling medical waste.

6.3 Biomedical Waste Management in Hospital 3

It is newly opened hospital, in Pune. Being fairly new, the biomedical waste generated is not very significant as compared to the old and established hospitals. It generates approximately 150 kgs. Medical waste in a month. In this hospital also the waste is segregated and disinfected at the source itself. It is then stored in colour-coded bins, in the area behind the hospital, from where it is picked by the CBWTF vehicle.

VII. CONCLUSION

After conducting survey of hospitals at Sinhgad road it is observed that all hospitals collecting medical waste in a separate bins and forwarding it daily through CBWTF.

Each hospital has separate room for storing medical waste and it is segregated at source only.

Common treatment facilities are necessary because it is not feasible for smaller health care establishment to set up a complete treatment and disposal system due to lack of space and trained manpower, minimum scale of operation and scale of economy.

As envisaged different kinds of treatments are required for different components of health care waste and the post treatment residues have to be safely disposed. It is desirable that every city should have at least one common treatment facility, which may be used by all the units who cannot have their own facility. It can be setup at the treatment, disposal and landfill site for the garbage, with adequate precaution and control. It is recognized that the management of hazardous hospital waste is not only a technical problem, but is intimately influenced by cultural, social and economic circumstances, at the local level.

Bio-medical waste is not being mixed with other waste of Municipal Corporation. Special vehicle i.e. biomedical waste vehicle are provided to collect waste from private hospitals and private medical clinics and carry it up to the main bio medical treatment plant.

Recommendations

1. PMC should conduct regular monitoring of parameters in the case of liquid waste for safe environmental protection.
2. PMC should provide the facility of vaccination to all personnel involved in BMW management against hepatitis-B, by conducting free camps, especially for the employees handling biomedical waste.
3. Hospital should provide adequate & appropriate protective devices to the staff involved in BMW disposal in the hospital.
4. There should be proper co ordination and cooperation at all levels of discarding medical waste i.e. PMC, Hospitals and organizations discarding biomedical waste.
5. The formulation of a local or regional committee, where each hospital is represented and members can share ideas and experiences, and can work together to address common problems and formulate an uniform and perhaps cooperative solutions that are technically and economically feasible, should be strongly adapted.
6. Training should be given to some number of persons from staff and protective devices and apparel such as gloves, face masks, gowned to allot for handling the waste. Fund should be allocated for the use of incinerator.

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