



BIOMEDICAL WASTE MANAGEMENT PRACTICES IN PUBLIC AND PRIVATE SECTORS HOSPITALS OF INDIA

Basavaraj Gaddigal¹ and Dr. Ramesh R Kulkani²

¹Research Scholar, Kousali Institute of management studies.

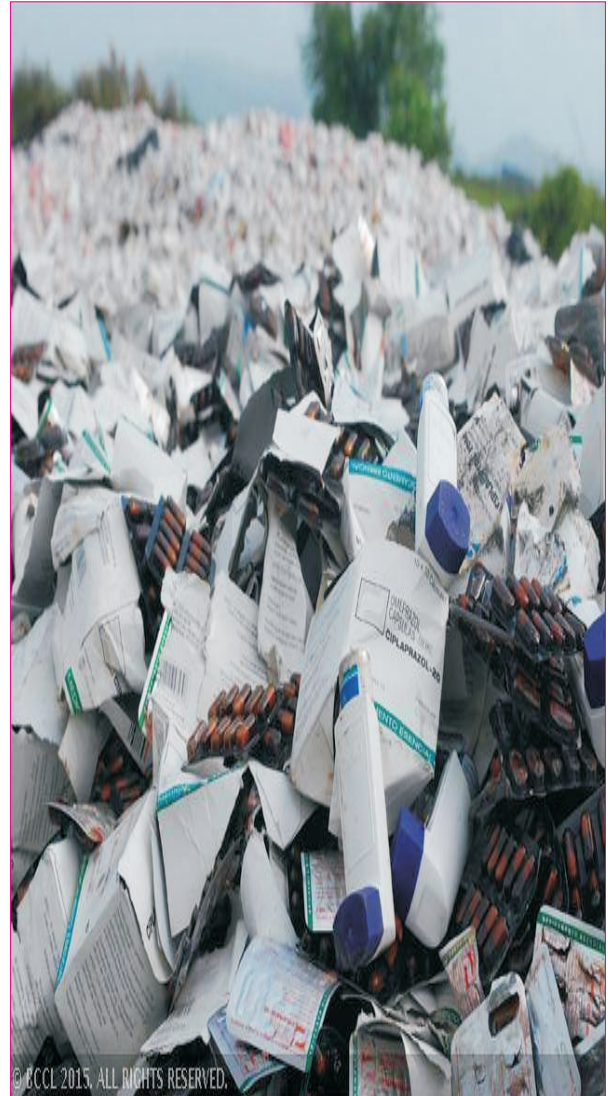
²Associate professor, Kousali Institute of management studies.

ABSTRACT:

PURPOSE: The study aims to provide information about the Bio medical waste management practices such as segregation, storage, treatment and disposal of hazardous waste produced by the hospitals in India. Bio medical waste (BMW) causes the serious health hazards if they are not treated properly. BMW produced by the hospitals need to get proper treatment facilities, our study gets the detail information of exiting BMW management practices.

CONCLUSION

Various factors like population growth, improper biomedical waste management practices and negligence of the concerned authority leading to no control over the biomedical waste which is effecting the environment. The study conclude that there is a urgent need for educating about proper biomedical waste management practice



Basavaraj Gaddigal

among the people concerned with hospitals and population in large.

KEYWORDS: Biomedical waste, waste management practice, hazardous waste, BMW treatment facilities

INTRODUCTION:

In every hospitals patient care activities are carried out, during the process certain waste is produced which are considered harmful for the human beings and environment. The waste produced includes cotton, bandages, needles, syringes, human waste etc. such names are commonly called as bio medical waste (BMW), and other names are clinical waste, medical waste, hazardous waste and healthcare waste.

The waste generated in hospitals contains just 15-20% of

harmful/hazardous waste remaining being general waste such as paper, drugs, cardboard, organic waste etc. The general waste is treated by the local corporation/municipal, but for BMW special precautions and treatment facilities are required, so that it does not cause any harm to human beings and environment. Hospitals waste defined as all waste biologic and no biologic that is discarded and not intended for the further use. Various communicable diseases which may spread through water, sweat, blood, body fluids and contaminated organs are important to be prevented.

Due to potentiality of causing harm by BMW mentioned above it is one of the most priorities for a Hospital Administration to put proper management as well as to keep a close watch over the waste management practice being followed by the labours who handle waste. Keeping this in view, the present study was conducted with the aim to know BMW management practices at the source of generation and disposal point of BMW.

BMW can be grouped on the basis of type of waste generated,

1. General waste: Wastes which can be treated as house hold waste and which can be recycled. E.g paper, glass, textiles, kitchen waste which are not contaminated by the infection.
2. Waste produced from medical environment: the waste which has the risk of infection but not hazardous waste. E.g plastic, clothes, syringes, drip bags which should not be contaminated with blood or any infectious fluids.
3. Hazardous waste/Infectious waste: infectious waste requires proper handling to avoid infection in the environment. E.g blood, body fluids, body parts, sharps etc.
4. Laboratory waste: The waste which is produced during the laboratory examinations such as

BIOMEDICAL WASTE MANAGEMENT PRACTICE

1. AT THE POINT OF WASTE GENERATION

The treatment of patients leads to the generation of waste and that is the origin of BMW. Hospital administration should thoroughly understand the process and the important of handling and disposal of the BMW. The BMW management practice includes:

- Segregation of BMW
- Packaging
- Labelling

Segregation of Biomedical waste is the process of collecting the waste from the generated point and to properly separate and store. Infectious and non infectious waste must be segregated at the point of generation itself where the waste can be stored for one or two days at a particular temperature without the risk of spreading infection. It is important for the Hospital to undertake a successful segregation plan in order to meet the disposal regulations. The waste handling labours should be well trained to handle the waste and labours should take the necessary precautions by wearing the rubber hand gloves, shoes, caps and mask. There will be high risk of spreading infections to the labours.



IMAGE 1. SHOWING COLOUR CODED CONTAINERS



IMAGE 2.SHOWING COLOUR CODED BAGS



IMAGE 3. SHOWING THE DRESS CODE OF BMW LABOUR

Packaging and Labelling: Packaging and labelling is the most significant part of waste collection. Proper and safe practice must be followed to separate infectious waste from the other waste, colour coded containers and the labelled packages must be used for the effective segregation of the BMW. Containers of BMW should be properly labelled and marked with the universal biological hazard symbol to identify infectious waste. Colour coded double lined plastic bags must be used in all the containers.

Special precaution should be taken to pack the needles and the sharpen items because they can cause infection. Thick puncher proof bags and containers should be used . The area where the infectious waste is stored should be regularly disinfected to avoid the spreading of infection and required temperature should be maintained. The packaging should be air tight and vermin proof. The collected waste quantity should be monitored before disposal.



IMAGES 4&5. SHOWING THE CAUTION LABELLING ON THE CONTAINERS AND BAGS

2. CATEGORIES OF BIOMEDICAL WASTES

For the successful segregation of the BMW proper categories should be made in order to differentiate the waste.

TABLE 1. SHOWING THE CATEGORIES OF BIOMEDICAL WASTE < CONTAINERS < COLOUR CODES

CATEGORY	CLASS	TYPE OF CONTAINER	COLOUR CODING	WASTE DESCRIPTION
I	<ul style="list-style-type: none"> Human Anatomical Wastes. Blood and Body fluids 	<ul style="list-style-type: none"> Single Use Containers. Plastic Disposal bags. 	Red	<ul style="list-style-type: none"> Human Organs. Body parts. Body fluids. Blood and Blood products. Items saturated with blood or body fluids removed during or after treatment, Surgery or Autopsy.
II	<ul style="list-style-type: none"> Animal Wastes. 	<ul style="list-style-type: none"> Single Use Containers. Plastic Disposal Bags. 	Orange.	<ul style="list-style-type: none"> Animal Tissues, Organs, Body parts, Carcasses, Bedding, Blood and Blood products. Items contaminated with blood and fluids. Wastes from Surgery, Treatment, Autopsy. Wastes from experimental animals used in research. Wastes from Veterinary hospitals, Colleges and Houses.

III	<ul style="list-style-type: none"> • Microbiology 	<ul style="list-style-type: none"> • Single use containers. • Plastic Disposal bags. 	Light blue or Yellow.	<ul style="list-style-type: none"> • Wastes of laboratory cultures, stocks or specimens of micro-organisms. • Live or attenuated vaccines. • Human and animal cell cultures used in research. • Infectious agents from research and Industrial laboratories. • Wastes from the production of biological toxins, dishes and devices used to transfer cultures.
IV	<ul style="list-style-type: none"> • Water Sharps. 	<ul style="list-style-type: none"> • Sturdy cardboard. • Glass or Plastic container. 	Yellow with black stripes.	<ul style="list-style-type: none"> • Wastes from used and unused sharps such as needles, syringes, scalpels, blades, glass, etc... That are capable of punctures and cuts.
V	<ul style="list-style-type: none"> • Highly infectious water. 	<ul style="list-style-type: none"> • Single use containers. • Plastic or disposal bags. 	Yellow.	<ul style="list-style-type: none"> • Wastes containing highly infectious living and non-living pathogens.
VI	<ul style="list-style-type: none"> • Isolated water. 	<ul style="list-style-type: none"> • Single use containers. • Plastic disposal bags. 	Yellow or Yellow with black stripes.	<ul style="list-style-type: none"> • Biological wastes from discarded materials contaminated with blood, excretion exudes or secretions from isolated humans or animals.

VII	<ul style="list-style-type: none"> Discarded Medicine. 	<ul style="list-style-type: none"> Reusable sturdy cardboards. Glass or plastic containers. 	Yellow or Yellow with black stripes.	<ul style="list-style-type: none"> Outdated, Contaminated and discarded medicines.
VIII	<ul style="list-style-type: none"> Discarded glassware. 	<ul style="list-style-type: none"> Reusable sturdy boards. Glass or plastic containers. 	Black.	<ul style="list-style-type: none"> Wastes of glassware and equipment used.
IX	<ul style="list-style-type: none"> Solid waste. 	<ul style="list-style-type: none"> Single use containers. Plastic disposable bags. 	Yellow.	<ul style="list-style-type: none"> Wastes of soiled cotton, dressings, plaster casts, linen, bedding and packaging materials.
X	<ul style="list-style-type: none"> Disposals. 	<ul style="list-style-type: none"> Reusable sturdy cardboards. Glass or plastic containers. Plastic bags. 	Yellow, Light blue or yellow with black stripes.	<ul style="list-style-type: none"> Generated from disposable items excluding waste sharps.
XI	<ul style="list-style-type: none"> Liquid waste. 	<ul style="list-style-type: none"> NA 	NA	<ul style="list-style-type: none"> Wastes from the laboratory. Washing and cleaning. Housekeeping and disinfecting activities.
XII	<ul style="list-style-type: none"> Biotechnology wastes. 	<ul style="list-style-type: none"> Single use containers. Plastic disposable bags. 	Yellow, Light blue or Yellow with black stripes.	<ul style="list-style-type: none"> Generated from activities involving genetically engineered organisms or products and their cultures which are unsafe.
XIII	<ul style="list-style-type: none"> Slaughterhouse wastes. 	<ul style="list-style-type: none"> Disposable plastic bags. 	Orange.	<ul style="list-style-type: none"> Generated in the form of animal tissues, blood and bloody fluids.

XIV	<ul style="list-style-type: none"> • Incineration ash. 	<ul style="list-style-type: none"> • Disposable plastic bags. 	Yellow with black stripes.	<ul style="list-style-type: none"> • Ash generated in the incineration of any biomedical waste.
XV	<ul style="list-style-type: none"> • Chemical waste. 	<ul style="list-style-type: none"> • Sturdy containers. • Plastic holding bags. 	Yellow or Yellow with black stripes.	<ul style="list-style-type: none"> • Chemicals used in the production of biological and chemicals used in disinfection such as insecticides.

3. COLLECTION OF WASTE

The BMW collected from the point of generation should be transferred treatment and appropriate disposal. The BMW should be placed in the leak proof containers. The BMW can be carried by cart from the generation point to the BMW carrying vehicle. The vehicle which carries the BMW from collection point to treatment and disposal point should be fully covered, sunlight should not enter and the waste should not spill out at any point of transportation. As per the regulation the vehicle should maintain the standard vehicle body and should have the label of BMW carrier and Hazardous waste on it.



IMAGE 6. SHOWING THE BMW CARRYING VEHICLE

4. WASTE DISPOSAL AND TREATMENT PRACTICE

Government of India Ministry of Environment, Forestry and Climate change has given the set of procedures to be followed for BMW disposal and treatment. The disposal and treatment of BMW is carried out using one of the following technologies:

- Sterilisation (with steam, hot water, microwave or chemical wash)
- Incineration

STERILISATION

The sterilisation is the process to kill all the disease causing agents in the BMW.

To kill the disease causing agents BMW should be treated with saturated steam in the disinfection chamber, and need to compress the waste using a roller. In other disinfection chamber the same process need to be repeated and the waste now can be treated as a general waste and can be disposed as household municipal waste. The steam emitted should be cleaned by carbon filter.

The BMW having high moisture content can be sterilised by the process of microwave, the treatment facility should be completely sealed and the air emitted during the treatment should be treated and made it safe before releasing to the environment.

INCINERATION

The most used and effective treatment and disposal technique is Incineration. Disposal after sterilisation may also requires supervision. It is not completely possible to dispose the waste after sterilisation, though disease causing agents have killed it may contain cytotoxic and pharmaceuticals. Hence the incineration will be

the most effective way of disposal of BMW. Incineration technique is commonly followed by most of the BMW treatment facilities in the world.

Incineration process as follows:

BMW loading into the Combustion Chamber. In small BMW treatment plants the waste is loaded manually and in the larger plants the automated machines load the waste into the combustion chamber.

Combustion chamber: In the chamber first the water is dried from the waste by blowing the waste and low temperature carbonisation gas is released to break down.

Reheating the chamber: The chamber will be ignited after releasing fresh air into the combustion chamber. The temperature should be increased from 400o Celsius to 800o Celsius from start to end of the Incineration process. The heat generated by the process can be used to convert it into other energy form.

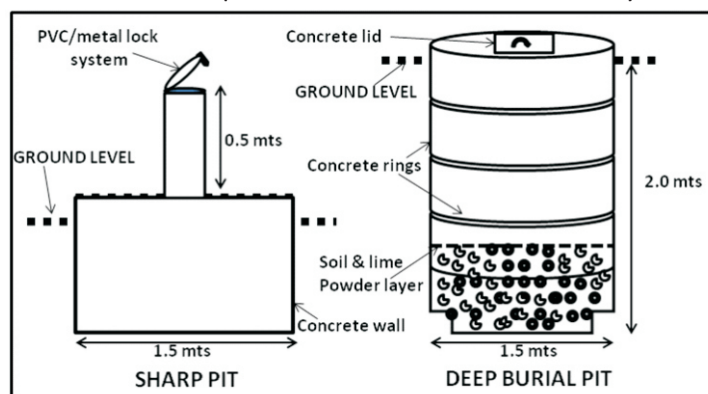
After the incineration the fuel and gas generated by the process should be purified.

DEEP BURIAL PIT AND SHARP PIT

The waste remained after the incineration process and sterilisation of BMW, the waste and sharpen should be buried in the DEEP BURIAL PIT and SHARP PIT permanently.

Standard for deep burial and sharp pit:

- A minimum of 1.5x2m of pit should be made.
- The site of the pit should be such that it avoids surface or ground water contamination
- The Pit should be fenced from all the sides and should be covered to prevent entry of steetdogs rodents and other scavengers.
- After every burial the pit should be closed with 10 cm of soil layer and 10 cm of lime layer.
- New pit should be made as soon as the old pit is half fill and should be closed by covering with lime and soil.



5. RECYCLING AND RECLAMATION

The wastes like plastic bottles, saline bottles, rubber tools, injection tubes, syringe tubes, pharmaceutical waste, laboratory waste, X- Ray sheets and other tools etc BMW can be treated and recycled. These above mentioned waste can be treated 3 process

- Disinfect them using Chemicals or by sterilisation
 - Break down into small pieces using scrubber
 - Collect the end material and process it to recycling.
- (Note: Plastic, rubber and glass materials should be treated separately)

CONCLUSION

By this study we can say that biomedical waste management practicesuch as segregation, storage, treatment is nearly understood. Most of the countries including India has necessary laws and guidelines for the Biomedical waste treatment and disposal in concern with environment and climate change. But due to various

factors like population, wrong waste management practices, negligence etc. there is no control over the proper biomedical waste disposal. It is responsibility of the every citizen, hospital administration and the authorities and government to make sure that proper biomedical waste management practice should be adopted. The study conclude that there is a urgent need for educating about proper biomedical waste management practice among the people concerned with hospitals and population in large.

BIBLIOGRAPHY

1.A DESCRIPTIVE STUDY ON EVALUATION OF BIO-MEDICAL WASTE MANAGEMENT IN A TERTIARY CARE PUBLIC HOSPITAL OF NORTH INDIA.

Rajiv Kumar†, Anil Kumar Gupta†, Arun Kumar Aggarwal† and Ashok Kumar†.Journal of Environmental Health Science and Engineering 2014

2.ASSESSMENT OF MEDICAL WASTE MANAGEMENT WITHIN SELECTED HOSPITALS IN GAZA STRIP PALESTINE: A PILOT STUDY AMAL SARSOOR* 1 ,Aaeid Ayoub2 , Ihab Lubbad3 , Abdelnaser Omran4 , Isam Shahrour5. International Journal of Scientific Research in Environmental Sciences

3.BIOMEDICAL WASTE MANAGEMENT – A REVIEW P. V. DESHMUKH DR.PANJABRAO DESHMUKH POLYTECHNIC, International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 Volume: 4 Issue: 6 66– 70

4.AWARENESS ABOUT BIO-MEDICAL WASTE MANAGEMENT AMONG HEALTH CARE PERSONNEL OF SOME IMPORTANT MEDICAL CENTERS IN AGRA SHALINI SHARMA, Senior member IACSIT.. International Journal of Environmental Science and Development, Vol. 1, No. 3, August 2010 ISSN: 2010-0264

5.COMPARING THE BIOMEDICAL WASTE MANAGEMENT PRACTICES IN MAJOR PUBLIC AND PRIVATE SECTOR HOSPITALS OF SHIMLA CITY. Saurabh Kumar1 , Salig Ram Mazta2 , Anmol K Gupta3 1 Assistant Professor, Department of Community Medicine, Father Muller Medical College, Mangalore, Karnataka, India, 2 Professor and Head, Department of Community Medicine, Indira Gandhi Medical College, Shimla, Himachal Pradesh, India, 3 Professor, Department of Community Medicine, Indira Gandhi Medical College, Shimla, Himachal Pradesh, India

6.BIOMEDICAL WASTE MANAGEMENT AND THEIR POSSIBLE HEALTH RISKS WITH CONTROLLING MEASURES IN BAREILLY CITY, UP, INDIA Amrita Singha *, JaspalSingha and A.P. Singha , RajendraSinghb a. Department of Environmental Science, Bareilly College Bareilly (UP) India b. Department of Zoology, Bareilly College Bareilly (UP) India. Octa Journal of Environmental Research Oct – Dec., 2014 International Peer-Reviewed Journal ISSN 2321 3655 Oct. Jour. Env. Res. Vol. 2(4)

7.ASSESSMENT OF THE AWARENESS AND PRACTICE ON MEDICAL WASTE MANAGEMENT AMONG HEALTHCARE PERSONNEL AT KENYATTA NATIONAL HOSPITAL, IN NAIROBI. Mercy WanjikuNjiruA thesis submitted in partial fulfillment for the degree of Master of Science in Epidemiology in the Jomo Kenyatta University of Agriculture and Technology.

8.BIO-MEDICAL WASTE MANAGEMENT: SITUATIONAL ANALYSIS & PREDICTORS OF PERFORMANCES IN 25 DISTRICTS ACROSS 20 INDIAN STATES INCLIN Program Evaluation Network (IPEN) study group, New Delhi, India

9.NEED OF BIOMEDICAL WASTE MANAGEMENT SYSTEM IN HOSPITALS - AN EMERGING ISSUE - A REVIEW PRAVEEN MATHUR, SANGEETA PATAN* and ANAND S. SHOBHAWAT Department of Environmental Science, MDS University Ajmer - 305 009 (India). Current World Environment Vol. 7(1), 117-124 (2012)

10.TOXIC ENVIRONMENTAL RELEASES FROM MEDICAL WASTE INCINERATION: A REVIEW. Satnam Singh, Vinit Prakash.

11.GOVERNMENT OF INDIA MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE NOTIFICATION New Delhi, the 28th March, 2016

12.STANDARD OPERATING PROCEDURES FOR HOSPITALS IN CHHATTISGARH. Department of Health and Family Welfare, Government of Chhattisgarh

13.MANAGING A MODERN HOSPITAL. A V SRINIVASAN, 2008

14.EMERGING TECHNOLOGIES IN BIOMEDICALWASTE TREATMENT AND DISPOSAL YASHASVI THAKUR*, Surjit S. Katoch.National Institute of Technology Hamirpur HP 177005 Indiayashasvi.thakur@gmail.com