

## **Strategies and Policies for Collection and Transportation of Biomedical Waste**

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### **1. Introduction**

The healthcare facilities across the state of Maharashtra however big or small generate a large amount of medical, biomedical and nonmedical waste, out of which it is extremely important to properly segregate and dispose the biomedical waste. Although the risks associated with hazardous medical waste and the ways and means of managing that waste are relatively well known and described in manuals and other literature, the treatment and elimination methods advocated require considerable technical and financial resources and a legal framework, which are often lacking.

Biomedical waste is generally defined as follows

- "Animal waste" is waste animal carcasses, body parts, and bedding of animals that are known to be infected with, or that have been inoculated with, human pathogenic microorganisms infectious to humans;
- "Biosafety level 4 disease waste" is waste contaminated with blood, excretions, exudates, or secretions from humans or animals who are isolated to protect others from highly communicable infectious diseases that are identified as pathogenic organisms assigned to biosafety level 4 by the centers for disease control, national institute of health, biosafety in microbiological and biomedical laboratories, current edition;
- "Cultures and stocks" are wastes infectious to humans and includes specimen cultures, cultures and stocks of etiologic agents, wastes from production of biological and serums, discarded live and attenuated vaccines, and laboratory waste that have come into contact with cultures and stocks of etiologic agents or blood specimens. Such waste includes but is not limited to culture dishes, blood specimen tubes, and devices used to transfer, inoculate, and mix cultures;
- "Human blood and blood products" is discarded waste human blood and blood components, and materials containing free-flowing blood and blood products;
- "Pathological waste" is waste human source biopsy materials, tissues, and anatomical parts that emanate from surgery, obstetrical procedures, and autopsy. "Pathological waste" does not include teeth, human corpses, remains, and anatomical parts that are intended for interment or cremation; and
- "Sharps waste" is all hypodermic needles, syringes with needles attached, IV tubing with needles attached, scalpel blades, and lancets that have been removed from the original sterile package.

The paper in detail will look at the protocols followed by the different medical facilities across various hospitals in Maharashtra during segregation and disposal of the waste. The paper will also help in understanding the awareness levels of the medical staff with respect to different methods and training involved in disposing off this waste.

### **2. Limitations of the study**

The present study is based on data collected from hospitals in and around Mumbai region in the state of Maharashtra. The researchers have approached 28 hospitals for the primary data collection, thus more number of hospitals could be approached for future research work.

### **3. Research methodology**

Looking at the importance of biomedical waste management practices, the researcher felt that there was a need to capture the various ways that are being followed by the hospitals for effective collection and transportation of BMW. For this study mainly primary and secondary data has been used. Secondary data and information has been collected from internet, newspapers, existing literature, magazines etc. The primary data has been collected

by interview from the staff of hospitals in and around Mumbai region. The researcher approached 28 hospitals but only 18 out of them allowed to collect the data. However, the hospitals did not allow the use of their names in this paper, thus none of the hospital under study has been named. The hospitals staff was encouraged to share their experiences about the day to day collection and transportation methods of BMW.

The researcher also tried to inform and create awareness among the ward boys who were not aware about the legal policies and color coding schemes related to BMW. The ward boys and nurses seemed very cooperative, and knowledgeable. However the doctors were very hesitant to answer the questions, primarily because except for the doctor in charge, the others were not aware of the segregation process. Therefore interviewing the doctors posed a problem and as a result, the researcher could interview only those doctors who were heads of BMW disposal. From each of the 18 hospitals, 4 staff was interviewed and the details are discussed in the section on findings.

#### 4. Findings of the study

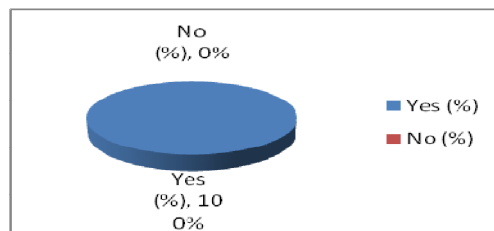
The analysis of the interviews revolved around eight questions. The staffs who were interviewed by the researcher included nurses and ward boys. Table 1 represents the responses from these 18 hospitals. Each of the eight questions is analyzed and discussed in details.

**Table 1** Response details from 18 hospitals

S.N	Factors	Total	Positive	Negative	% positive	% negative
1	Awareness about "Bio-medical waste"	72	72	0	100%	0%
2	Process of waste segregation	72	44	28	61%	39%
3	Awareness about the color coding of BMW	72	6	66	8.33%	91.77%
4	Daily basis collection	72	9	63	12.50%	77.50%
5	Adequate training	72	13	59	18.05%	81.95%
6	Collection and immediate segregation at the source	72	67	5	93.05%	6.95%
7	Adequate staff protection measures	72	65	7	90.27%	9.73%
8	Updated BMWM plan	72	3	69	4.16%	95.84%

##### Awareness about "Biomedical waste"

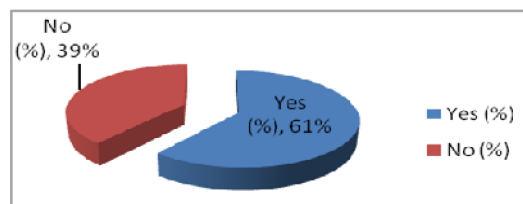
Knowledge about biomedical waste management rules among the technically qualified personnel like the doctors, nurses, and laboratory staff was satisfactory. The attenders and housekeeping staff also had knowledge about it. All the 72 respondents approached by the researcher were familiar with the term "Biomedical waste".



**Figure 1** Awareness about "Biomedical waste"

##### Process of waste segregation

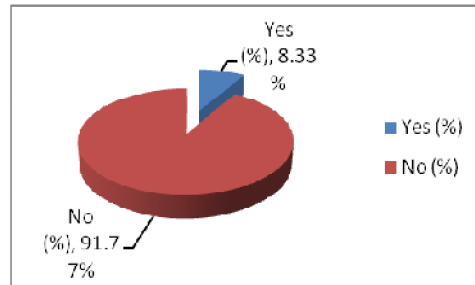
The generator is responsible for providing segregated waste to the operator. 61% of the respondents were familiar with the waste segregation process and 39% of them were not aware of the entire process.



**Figure 2** Process of waste segregation

### Awareness about the color coding of BMW

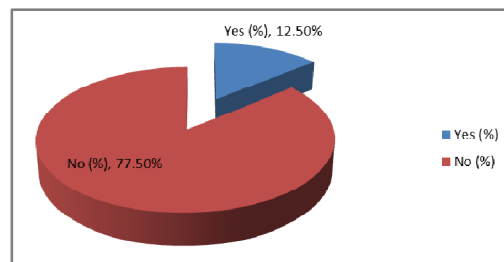
91.77% of respondents were not aware about the color coding recommendations of WHO- UNEP/SBC 2005 pertaining to collection and sorting of biomedical waste. Only 8.33 % of respondents were aware of this system. Awareness level must be thus increased. They only followed the instructions of the supervisor for the daily segregation of the waste.



**Figure 3** Awareness about the color coding of BMW

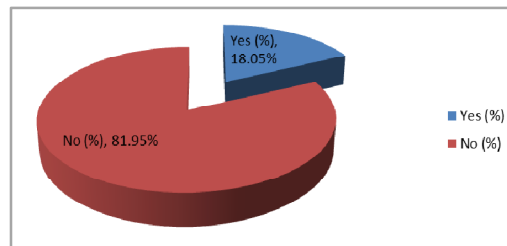
### Daily basis collection

Only 12.50% of respondents confirmed that the waste was collected on a daily basis. 77.50% of respondents said that the waste was collected twice or thrice a week.



**Figure 4** Daily basis collections

### Adequate training

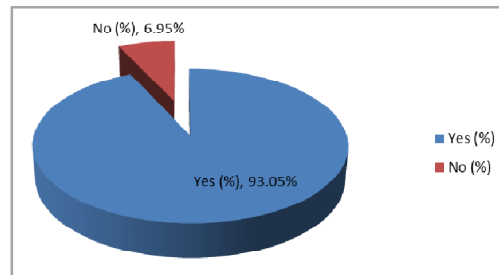


**Figure 5** Adequate training

18.05% of respondents were of the opinion that the training provided to them was adequate but 81.95% respondents said that the training programs should be frequently organized. Some of them informed that the last training that they received was three years back and they are not updated about the latest techniques and processes of handling BMW.

### Collection and immediate segregation at the source

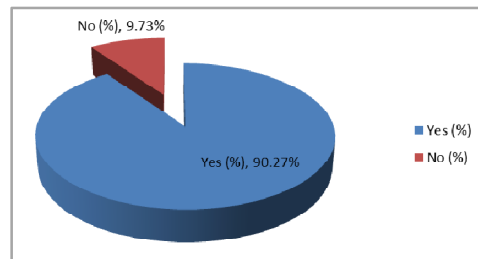
93.05% of respondents confirmed that the waste was collected and segregated at the source immediately. 6.95% of respondents said that the process took some time and it was not done immediately.



**Figure 6** Collection and immediate segregation at the source

#### Adequate staff protection measures

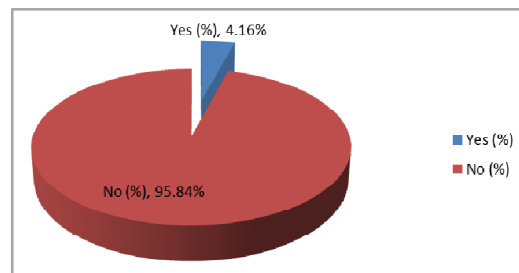
90.27% of respondents said that the staff protection methods were adequate and 9.73% of them felt that some more attention was needed towards protection methods.



**Figure 7** Adequate staff protection measures

#### Updated BMWM plan

4.16% of respondents were of the opinion that they are updated about the BMWM plans on a regular basis and 95.84% were not updated about any such plans.



**Figure 8** Updated BMWM plan

Every hospital, both private and government have to first be registered with the Maharashtra pollution control board (MPCB). This is the starting point, because this license gives the hospital the permission to generate biomedical waste. The license has to be renewed every 3 years. The MPCB has a tie-up with a BMW collection and disposal agency, by the name SMS enviro clean. SMS enviro clean is the only agency that reserves the right to conduct BMW transportation and disposal for both private and government hospitals. The MPCB has prescribed the costs for BMW disposal based on the number of beds in the hospital. Say the cost of BMW disposal for hospitals less than 100 is Rs XYZ. Whether or not the 100 beds are fully occupied is irrelevant in that case.

The van from enviro clean visits the hospitals regularly, sometimes on a daily basis and during other times, once in 2 days. On reaching the hospital, the bags (yellow, black and red) are weighed and the weight is recorded in the register for further records. Ideally 200-250 grams of BMW is generated per bed. If the number exceeds this figure grossly, it indicates that the other non BMW is getting mixed with the waste. Similarly, if the weight is far less than this figure, it means that the BMW is getting disposed-off with the common wastes. Enviro clean then transports the wastes to its incinerators in Talaja, where the wastes are disposed-off by incineration or deep burial.

The segregation of BMW is done at the site of generation and the protocol followed is standardized. Table 2 describes the color coding system followed and the treatment options available.

**Table 2** Color coding, types of containers and the treatment options

Color Coding	Type of Container -I Waste Category	Treatment options as per Schedule I
Yellow	Plastic bag Cat. 1, Cat. 2 and Cat. 3, Cat. 6.	Incineration/deep burial
Red	Disinfected container/plastic bag Cat. 3 Cat. 6, Cat.7.	Autoclaving/Microwaving/ Chemical Treatment
Blue/White translucent	Plastic bag/puncture proof Cat. 4 Cat. 7. Container	Autoclaving/Microwaving/ Chemical Treatment and destruction/shredding
Black	Plastic bag Cat. 5 and Cat. 9 and Cat. 10. (solid)	Disposal in secured landfill

## 5. Concluding Recommendations

Biomedical waste management is not just a rule, but a social responsibility as well. The awareness level about BMWM has increased in past few years but the color coding system for this waste has yet a long way to go. It is an essential part of this process and it must be taken care on an urgent basis. Many of the hospital staff has not yet learnt that discarded medicines go into black plastic bags, body parts into yellow and laboratory waste into red bags. Thus training about color coding and creating awareness amongst hospital staff is the key to having a good waste management system. The operator must collect the BMW on a daily basis from the waste generators as it would then ensure that the waste has to be segregated at the source and on an immediate basis. The hospital authorities must take care as to conduct sessions on BMWM and ensure that the each staff is updated about the latest information on BMW. Adequate measures must be taken for protection of the staff involved in the collection and transportation of BMWM. These steps would not only be taken for the hospitals in Maharashtra but in each state of India to ensure that each healthcare and sanitation worker is free from any kind of health hazard.

## 6. References

1. Chetan Bora [2012] Mumbai Mirror, dated 16/4/2012, pp 01.
2. Daily News Analysis, Mumbai, dated 24/10/2009.
3. Dr Jitendra Sangewar [2012] Mumbai Mirror, dated 20/4/2012, pp 03.
4. Disposal agency raises giant red flag, Mumbai Mirror, dated 16/4/2012, pp 01.
5. Indian Express, Mumbai, dated 26/02/2008.
6. Ministry of Environment and forest notification on the Bio-Medical Waste [Management and Handling] Rules, 1998.
7. Mathur V, Dwivedi S, Hassan MA, Misra RP. Knowledge, attitude, and practices about biomedical waste management among healthcare personnel: A cross-sectional study. Indian J Community Med 2011; 36:143-5.
8. Patil AD, Shekdar AV. Health-care waste management in India. J Environ Manage 2001; 63:211-20.
9. Sudeshna Chatterjee and Jyoti Shelar [2012], After Masina shocker, biomedical waste.
10. Sudeshna Chatterjee, Dumped bio-waste ours, Masina confesses, Mumbai Mirror dated 20/4/2012, pp 03.
11. Times of India, dated 12-10-2009.  
Veda Hegde, RD Kulkarni and GS Ajantha [2007] , Journal of Oral Maxillofacial Pathol, Vol 11, Issues 1, pp 5-9.