

Original Research Article

**BIOMEDICAL WASTE MANAGEMENT: AN  
ASSESSMENT OF KNOWLEDGE, ATTITUDE AND  
PRACTICE AMONG HEALTHCARE WORKERS IN  
RURAL TERTIARY CARE HOSPITAL IN  
MAHARASHTRA**

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**ABSTRACT**

**INTRODUCTION:** Bio-medical waste (BMW) comprises the waste which is generated from the health care system during the process of health care delivery. Inappropriate and inefficient management & disposal of BMW can lead to infectious hazards, malignancies, malformations and environmental (air, land & water) pollution-not only to current generation but also for future generations. In order to improve medical waste management, it is important to understand and evaluate the current practices in medical waste management, to identify the gaps and to address them. The present study had been taken up to assess the biomedical waste management in healthcare facility and to recommend measures for improvement based on the findings of the study.

**MATERIAL AND METHODS:** This observational, descriptive, hospital based study over a period of 1 month from 1<sup>st</sup> of April 2023 to 30<sup>th</sup> April 2023. The study group comprised of health care workers who included Doctors, Nurses, Laboratory Technicians and Housekeeping staff.

Data was collected using a pre-designed, structured questionnaire to assess the knowledge, attitude, and practices on various aspects of

**BMW.RESULTS:** 400 participants including 150 doctors of different specialties, 170 nurses, 30 laboratory technicians and rest were housekeeping staff 50. Analysis of the compiled results showed that doctors, nurses and Laboratory technician were having better knowledge, attitude and practice of the waste management rules and guidelines. The knowledge among housekeeping staff was found to be lacking.

**CONCLUSIONS &RECOMMENDATIONS:** Repeated and comprehensive training programs should be arranged on BMWM. Functional Biomedical waste management Committee should supervise and monitor safe biomedical waste management. Biomedical waste audit is necessary to evaluate the patient care areas but also to find out the weak links and small hindrances.

**Key Words:** Biomedical Waste (BMW), Health Care Workers, Knowledge, Attitude, Practices

### **INTRODUCTION:**

Bio-medical waste (BMW) comprises the waste which is generated from the health care system during the process of health care delivery.<sup>1</sup> It is defined as the waste generated during diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological or in health camps including the categories mentioned in schedule I appended to the rules.<sup>2</sup> As per WHO fact sheet, hospital wastes comprise of non-hazardous waste (85%), hazardous infectious waste (10%) and hazardous non-infectious waste (5%). In short, approximately 10-20% of the waste generated by the above mentioned units is reported to be infectious or hazardous.<sup>3</sup> Infectious waste includes all those medical wastes, which have the potential to transmit viral, bacterial, fungal or parasitic diseases. It includes both human and animal infectious waste and the waste generated in any laboratory and during veterinary practice. Any waste with a potential to pose a threat to human health and life is called hazardous waste. Infectious waste is hazardous in nature, and if the infectious component mixes up with the general non-infectious waste in the black bag, the entire bulk of that black bag waste becomes potentially infectious and to be treated as infectious waste. Therefore, the hospital waste, in addition to the risk for patients and workforce who handle these wastes, poses a serious threat to public health and environment.<sup>4</sup> The acceptable Biomedical Waste Management (BMWM) process includes vital steps i.e., handling, segregation, mutilation, disinfection, storage, transportation, treatment, and disposal. The main purpose of BMWM is to reduce volume of waste and ensure its efficient collection, handling, and safe economical disposal.<sup>5</sup> Taking cognizance of inappropriate BMW management, Ministry of Environment and Forests notified the 'BMW(management and handling) Rules, 1998' in July 1998. BMW Management Rules have thereafter undergone timely revisions to meet the prevailing needs. Till date, four amendments have been made in 2000, 2003 and 2011 with these latest, most comprehensive and effective guidelines coming into force from 28<sup>th</sup> March 2016.<sup>6,7,8</sup> In order to improve medical waste management, it is important to understand and evaluate the current practices in medical waste management, to identify the gaps and to address them. The present study had been taken up to assess the biomedical waste management in healthcare facility and to recommend measures for improvement based on the findings of the study.

**MATERIAL AND METHODS:**

This observational, descriptive, hospital based study was undertaken in 512 bedded rural government medical college & hospital in central part of Maharashtra over a period of 1 month from 1<sup>st</sup> of April 2023 to 30<sup>th</sup> April 2023. The study group comprised of health care workers who included Doctors, Nurses, Laboratory Technicians and Housekeeping staff in our Hospital after taking their informed consent.

Data was collected using a pre-designed, structured, self-administrated questionnaire. Questionnaire was designed to assess the knowledge, attitude, and practices on various aspects of BMW such as its hazards, rules, management, the color coding for segregation and methods used for disposal. Questionnaire was divided into three parts; part 1 comprised of six questions on Assessment of knowledge of biomedical waste management, part 2 included five questions on Assessment on attitude towards biomedical waste management, part 3 had eight questions on Assessment on practices related to biomedical waste management. It was emphasized that the confidentiality of the responses made by them would be strictly maintained. The data was analyzed using Microsoft Excel.

**RESULTS:**

A total of 400 health care workers included in the study after taking their informed consent. As participation was voluntary, many choose not to take part. The collected responses were evaluated by the study supervisor. At the end, the checked responses were re-circulated and discussed among the participants to increase comprehension. Out of the 400 participants, 37.5% ( $n = 150$ ) were doctors of different specialties, 42.5% ( $n=170$ ) were nurses, 7.5% ( $n=30$ ) were laboratory technicians and rest were housekeeping staff 12.5% ( $n=50$ ). (Fig.1) Analysis of the compiled results showed that doctors, nurses and Laboratory technician were having better knowledge, attitude and practice of the waste management rules and guidelines [Table 1, Table 2, Table 3]. Even though our hospital has a well-developed BMW system in place, the knowledge among housekeeping staff was found to be lacking. It was found that 70% of the participants knew it was necessary to segregate infectious from noninfectious waste. This leaves a staggering 30% of health-care workers unaware of the problem (Table 3). Knowledge of color-coded bins used in our facility was good among all groups except the housekeeping staff, of whom only 44% answered this question correctly (Table 1).

**DISCUSSION:**

The study revealed several lacunae in the knowledge, attitude and practices among the Health care worker. Health professionals have an ethical responsibility towards the environment and themselves. Because of the nature of their profession, they must not forget that they are at risk for treating patients who may have infectious diseases.

Knowledge of BMW management rules and legislation, Segregation of BMW as per Colour coding, Health Hazards while handling BMW, Methods of sterilization & disinfection regarding BMW management among doctors, nurses and laboratory technicians was found to be significantly better as compared to Housekeeping staff in our study. Similar finding was reported in previous studies done by Parida *et al.*, Anand *et al.*, Gawande *et al.*,<sup>9, 10, 11</sup> The lack of formal

education among Housekeeping staff might play a factor in low awareness among them. and continuous training programmes were needed to enhance it.<sup>12,13</sup>

Attitude of doctors, nurses and lab technicians towards BMW management was found to be positive in our study as compared to Housekeeping staff. It was consistent with the findings of Anand *et al.*, where they found that attitude of an individual towards any health behaviour was directly proportional to knowledge level of that individual.<sup>10</sup> What is encouraging to see is majority of health personnel in present study wanted to upgrade their knowledge on BMW management seen also in a previous study.<sup>14</sup>

In BMW Management, focus has shifted to the reduction of infectious waste volume. This reduction can be achieved by first segregating infectious waste from noninfectious waste at the point of generation only. In this study, 70% of the participants knew that the key step is segregation, but 30% of all HCWs did not know how to differentiate infectious from noninfectious waste. On simplification, only 39% of the housekeeping staff could tell the proper color coding of waste. Similar findings were observed by Anand *et al.*, Mathur *et al.*, and Soyam *et al.*,<sup>10,12,15</sup> The most worrying point was nearly half of the HCW population is unaware of the prerequisite of treatment of laboratory waste before sending out of the facility for final disposal at Common Bio Medical Waste treatment facility. Even in the case of laboratory technicians, 79% answered this question correctly and this finding was consistent with the findings of study done by Parida *et al.*,<sup>9</sup>

Reporting of injury due to sharps was average among all groups except Housekeeping staff in our study whereas in Anand *et al.*, study approximately 29% of doctors reported injury due to sharps.<sup>10</sup> Parida *et al.*, reported that 69% of study population ever reported needle stick injury.<sup>9</sup>

Laboratory technicians and Housekeeping staff were poorly aware of adhering to the principles of hygiene, which agrees with the finding of Parida *et al.*,<sup>9</sup> Anyone working in the health sector, that comes in contact with infectious material daily, must have adequate knowledge of health-care waste management. Anything less than absolute perfect knowledge is a disaster waiting to happen.

In this study, even though doctors knew the importance of health-care waste management, when it comes to guidelines, their knowledge is not complete. The gravity of this issue just cannot be ignored. To increase awareness, the curriculum of medical, postgraduate, nursing, laboratory technology, and other paramedical courses should give higher importance on biomedical waste, its hazards, and its impact on the society.

#### **CONCLUSIONS & RECOMMENDATIONS:**

- Hospitals should arrange & conduct repeated and comprehensive training programs (starting with induction of all new appointees to once a year thereafter) on BMW and Mandatory attendance and periodic assessments should be included in yearly performance assessment of all HCWs to increase compliance.
- As many HCWs were not immunized against Hepatitis B, so it should be made compulsory to get vaccinated.
- Pollution Control Boards should monitor effectively and frequently.

- Biomedical waste management Committee should supervise and monitor the implementation of rules and guidelines regarding safe biomedical waste management.
- Biomedical waste audit (Daily & Monthly) is necessary for all hospitals not only to evaluate the patient care areas but also to find out the weak links and small hindrances which can be solved with a little attention to achieve overall quality improvement in biomedical waste management practices to reduce hospital acquired infection rates.

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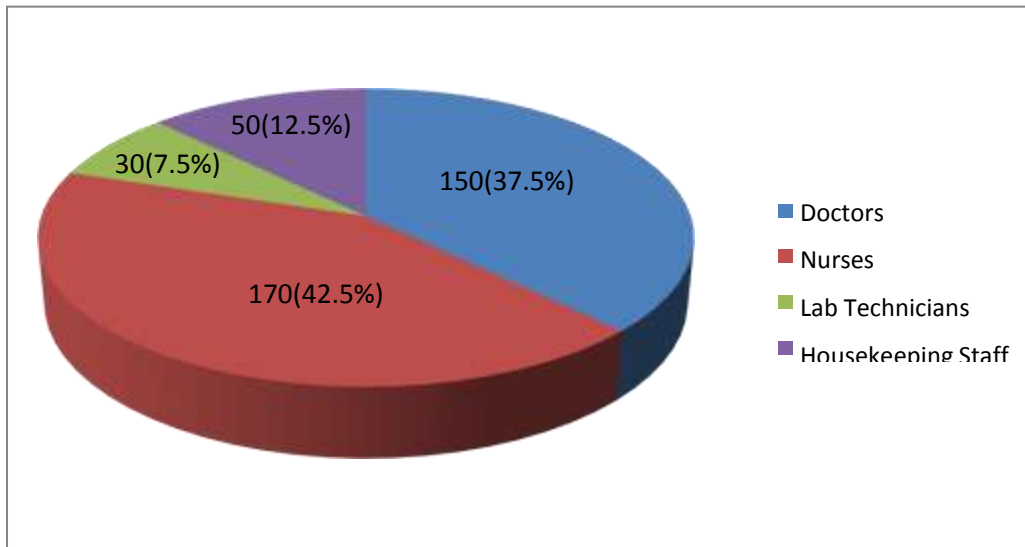


Figure1.Demography of Study Population

Knowledge	Doctors	Nurses	Laboratory Technicians	Housekeeping Staff	Total
Awareness of Bio medical waste management rule & legislation	86%	81%	78%	42%	77%
Symbol of BMW	88%	90%	84%	66%	82%
Segregation of BMW as per color coding	84%	86%	80%	44%	73%
Time of storage of BMW in hospital	68%	74%	72%	55%	67%
Health Hazards while handling Biomedical waste, its prevention & management	64%	67%	65%	39%	58%
Methods of sterilization and disinfection	81%	78%	84%	68%	78%

Table 1: Knowledge among Health care workers about Bio- Medical Waste Management rules 2016

Attitude	Doctors	Nurses	Laboratory Technicians	Housekeeping Staff	Total
Safe disposal of BMW is necessary	98%	94%	86%	52%	82%
BMW management is team work	91%	97%	79%	45%	78%
BMW management is part of job	92%	95%	88%	48%	81%

Training & upgrading knowledge on BMW management	98%	92%	90%	57%	84%
Periodical medical examination	95%	91%	78%	60%	81%

**Table 2: Attitude among Health care workers about Bio- Medical Waste Management rules 2016**

Practices	Doctors	Nurses	Laboratory Technicians	Housekeeping Staff	Total
Differentiating infectious waste from noninfectious waste	80%	84%	77%	39%	70%
Tying up waste bag when its ¾ filled	71%	92%	75%	48%	72%
Not recapping used needle	98%	97%	99%	65%	90%
Treatment of Laboratory waste before discarding	48%	64%	79%	10%	50%
Hepatitis B Vaccination	90%	76%	68%	32%	66%
Reporting of sharp related injury	64%	68%	58%	28%	55%
Hand hygiene	82%	86%	64%	40%	68%
Maintain daily register for waste disposal	68%	94%	84%	62%	77%

**Table 3: Practices among Health care workers about Bio- Medical Waste Management rules 2016**