

## Awareness and practices regarding biomedical waste management among health care workers in a tertiary care hospital in Himachal Pradesh

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### Abstract

**Introduction:** Biomedical waste has a higher potential for infections and injuries. With an endeavor to reduce health problems, it is essential to have safe and reliable method of segregation and disposal of hospital waste. With this background the present study was conducted to assess the knowledge, attitude and practice of biomedical waste management among health care personal in Dr. Rajendra Prasad Government Medical College (DRPGMC) Tanda, Himachal Pradesh.

**Materials and Method:** A cross sectional questionnaire based survey containing 30 questions to assess the knowledge, attitude and practices on biomedical waste management.

**Results:** The mean knowledge, attitude score were higher as compared to practices. Significant differences exist in relation to educational qualification of respondent in knowledge and practice score.

**Conclusion:** The present study revealed that knowledge and attitude regarding biomedical waste management among health personal and students of the institute was higher as compare to practice.

**Keywords:** Biomedical waste management.

### Introduction

Biomedical or hospital waste refers to any waste generated while providing healthcare, performing research and understanding investigation or related procedures on human beings or animals in hospitals, clinical laboratories.<sup>1</sup>

The waste generated from the healthcare facilities carries a higher potential for infections and injuries. With an endeavor to reduce health problems and to eliminate imminent jeopardy to people's health. It is essential to have safe and reliable methods of segregation and disposal of hospital waste. First of all biomedical waste management and handling rules came in 1998. Since then every health personal is expected to have proper knowledge, practice and capacity to guide others for waste collection, management and proper handling techniques.<sup>2</sup> These biomedical waste management rules were amended subsequently in 2011 and then in March, 2016. It is estimated that quantity of solid waste generated in hospital varies from half to one kilogram/bed in governmental hospitals.

These rules makes mandatory for health care establishments to segregate, disinfect and dispose their wastes in an eco-friendly manner. Main pre-requisite and key to successful waste management program is segregation. Segregation and collection of various categories of waste should be done at the source, so that each category is treated in a suitable manner to render its harm. For waste management to be effective, the waste should be managed at every step from generation to disposal.<sup>3</sup>

Hence with this background present study was conducted to assess the knowledge, attitude & practice of biomedical waste management among healthcare personnel in tertiary care hospital. DRPGMC Tanda, Himachal Pradesh.

### Materials and Methods

This study was a cross sectional questionnaire based survey conducted in a 750 bedded tertiary care & teaching hospital in Himachal Pradesh. A prefabricated validity tested questionnaires randomly distributed among Doctors, Nurses, Technicians and other Paramedical staff of the hospital. The questionnaires contained 30 questions on assessment of knowledge, attitude and practice regarding biomedical waste management. All questions in questionnaire were close-ended.

The questionnaires were distributed by the faculty members of various departments. The respondents were asked to return the questionnaire immediately.

All returned questionnaires were coded and analyzed. Results were expressed as a number and percentage of respondent for each question.

### Results



A total of 150 questionnaires were distributed out of which 120 were received back. The 120 respondents comprised of 50 Doctors (41.66%), 40 Technicians (33.33%), 30 Nurses (16.66%) and 10 other Paramedical staff (8.33%).

**Table 1: Profile of respondents**

S. No.	Educational Qualification	Number	% age
1	PG Students + Interns	50	41.66
2	Technicians (SLT + LT)	40	33.33
3	Nurses (Trained nursing staff & Final year B.Sc. Nursing students)	20	16.66
4	Other Paramedical staff	10	8.33

Response to knowledge based questions on biomedical waste management

**Table 2: Assessment of knowledge attitude and practice on biomedical waste management**

S. No.	Question	Response	Percentage
1.	Are all healthcare wastes hazardous?	Yes 100 No 20	88.3% 16.7%
2.	Are you aware that biomedical waste management rules modified in 2016	Yes 80 No 40	66.6% 33.4%
3.	Can any plastic bag be used for waste disposal?	Yes 100 No 20	83.3% 16.7%
4.	Have you had any training in biomedical waste management?	Yes 96 No 24	80% 20%
5.	Are you aware of IMAGE?	Yes 45 No 75	37.5% 62.5%
6.	If yes, what does IMAGE stand for? a. Indian Medical Association for Greener Environment. b. Indian Medical Association for Go Green Eco friendly c. Indian Medical Association Goes Eco friendly d. Don't know	20 50 30 20	16.7% 41.67% 25% 16.7%
7.	According to the national guidelines, what is the maximum time limit for which biomedical waste can be stored? a. 24 hours b. 72 hours c. 48 hours d. Don't know	50 10 40 20	41.7% 8.3% 33.3% 16.7%
8.	Which of the following is the universally accepted symbol for biohazard?	20  100 	16.6% 83.4%
9.	Do you feel that biomedical waste management should compulsory be made part of undergraduate curriculum?	Yes 70 No 50	58.3% 41.7%

**Table 3: Response to attitude based question on biomedical waste management**

10.	Do you agree that biomedical wastes should be segregated into different categories	Yes 110 No 10	92.7% 8.3%
11.	Do you think your knowledge regarding biomedical waste management is adequate?	Yes 100 No 20	83.3% 16.7%
12.	Do you think you require any further training on biomedical waste management?	Yes 90 No 30	75% 25%
13.	Does your institute have tie up with waste management companies?	Yes 110 No 10	91.7% 8.3%

**Table 4: Response to practice based on question on biomedical waste management**

14.	Does your institute have incinerator for treatment of biomedical waste management?	Yes 20 No 100	16.7% 83.3%
15.	Do you dispose all kind of waste into general garbage	Yes 5 No 115	4.3% 95.7%
16.	Do you segregate the biomedical waste according to different categories?	Yes 110 No 10	91.7% 8.3%
17.	Where do you dispose cotton, guaze and other items contaminated by blood? a. Red Plastic Bag b. Yellow Plastic Bag c. General waste d. White container	25 80 3 12	20.8% 66.7% 2.5% 10%
18.	Where do you dispose pharmaceutical waste? a. Black Plastic Bag b. Red Plastic Bag c. Yellow plastic Bag d. White container	10 25 75 10	8.3% 20.8% 62.6% 8.3%
19.	Where do you dispose waste sharps? a. Black Plastic Bag b. Red Plastic Bag c. White container d. Yellow Plastic Bag	12 8 90 10	10.0% 6.7% 75.0% 8.3%
20.	Where do you dispose excess mercury and mercury contaminated cotton? a. Drain b. General garbage c. Plastic Bag d. Yellow plastic Bag	40 10 10 60	33.4% 8.3% 8.3% 50%
21.	How do you dispose the hazardous liquid waste? a. Drain b. General garbage c. Chemical treatment and drain discharge	45 10 65	37.5% 8.3% 54.2%
22.	According to modified biomedical waste management 2016, Can biomedical waste cross border for its treatment?	Yes 5 No 115	12.5% 87.5%
23.	Incineration is safe method for treatment of a. Anatomical waste, animal carcasses & amputated limbs b. Microbiological waste c. Infected metallic implants	90 20 10	75% 16.7% 8.3%
24.	Where do you dispose contaminated glassware & medicine vials a. Yellow Bag b. Red Bag c. White container with biohazard label d. Blue card board box	22 8 10 80	17.0% 8.0% 8.3% 66.7%
25.	Which bag to be used for disposal of gloves? a. Red Bag b. Yellow Bag c. Either of two d. None	85 20 12 3	70.8% 16.7% 10.0% 2.5%
26.	Proper method for needle disposal a. Recapping b. Burning and cutting c. Disinfection in sodium hypochlorite d. All	10 80 25 5	8.3% 66.7% 20.8% 4.2%
27.	Various steps in waste management, reduction Segregation storage transportations and treatment	Correct Answer	70%
28.	Inertisation is a process of mixing waste with Cement before disposal of toxic substances	Correct Answer	20%
29.	Biomedical waste is treated at 850-2000°C in incinerator	Correct Answer	65%
30.	In Indian condition about 1.5-2 kg of waste per bed per day is generated.	Correct Answer	60%

About (88.3%) of the respondents (n=100) considered all health care wastes hazardous. 33.4% of the respondents (n=40) were not aware of the fact that biomedical waste management rules modified in 2016. Only 10% of the respondents opined that any plastic bag can be used for waste disposal, around 80% had received training on biomedical waste management. Only 37.5% were aware of the IMAGE and of them 25% knew the correct abbreviation of IMAGE. Only 33.3% knew the maximum storage period for biomedical waste according to national guidelines is 48 hours. Around 83% respondents correctly recognized the symbol of biohazard. In majority of the knowledge related questions significant differences in responses were observed in relation to educational qualification.

Table 3 contains the responses to attitude based questions on biomedical waste management. The response showed a favorable positive attitude towards the topic of discussion. No significant differences in response were observed in relation to different groups assessed in the study.

Table 4 has responses to practice based questions on biomedical waste management. About 91% agreed that the institute in which they are working had a tie up with waste management companies. Only 4% disposed all waste in general garbage. Majority of the respondents (66.7%) disposed blood soaked cotton gauze etc. in blue bags, also (62.6%) disposed pharmaceutical wastes in yellow bags, 75% disposed sharps in white translucent puncture proof container. About 50% stored the excess mercury & mercury contaminated cotton in glycerin, 54.2% treated the liquid waste with chemical before discharging into drains. Majority of the respondents (87.5%) knew that according to modified biomedical waste 2016 rules, hospital waste cannot cross the state border for treatment.

About 66% respondents dispose contaminated glassware & medicine vials in blue card board box. 70% disposed used gloves in red bag and around 66% were aware about the proper method for needle disposal.

70% respondents knew that various steps of biomedical waste management according to new Rules only 20% were aware how toxic substances are disposed off. 60% respondents had knowledge that Indian condition about 2 kg of waste per bed per day is generated.

## Discussion

Medical institutions, hospitals and other health care establishments have a "duty of care" for the environment and public health. As hospitals use a wide variety of drugs such as antibiotics, cytotoxics, corrosive chemicals, radioactive substances which ultimately become part of hospital waste. The introduction of disposables in hospitals has brought in its wake many ills such as inappropriate recycling, unauthorized and illegal re-use.

The ministry of Environment & Forest and Climate change, Govt. of India has notified the draft biomedical waste management Rules 2011 under Environmental Protection Act 1986 to replace the earlier Biomedical waste Rules 1998 and recent amendments on 28<sup>th</sup> March 2016. In

recent rules more emphasis on improve the collection, segregation, processing, treatment and disposal of biomedical waste in an environment ally sound manner thereby reducing the biomedical waste generation and its impact on environment.

The new feature in 2016 Rules of Bar Code system for bags and containers containing biomedical waste is expected to eliminate pilferage and restrict the entry of waste in illegal recycling market. The preview of new rules has been expanded to include vaccination camps, blood donation camps, surgical camps and other health care activities. Also simplified the waste segregation process at the source of generation. Knowledge, attitude and practice act as three pillars, which make up the dynamic system of life itself. Knowledge being a basic criterion that allows one to earmark between the right and wrong. Attitude accredits to thinking towards a proper situation. Practice means contemplation of rules and knowledge that lead to action. Thus a right knowledge, a positive attitude, a good practice are imperative to guide and serve the patients.<sup>4,5</sup> Thus this study was conducted with objective of assessing the knowledge, attitude and practice regarding biomedical waste management among health care personnel.

It is an important observation that about 83% (n=100) of the respondents considered all healthcare wastes to be hazardous. This awareness is the better than the result conducted among dental health personnel in three dental colleges in Delhi by Sood et al.<sup>6</sup> Only 72% of the respondents were aware of the fact that the biomedical waste management and handling rules were applicable to them. However studies conducted in Amritsar<sup>7</sup> Delhi<sup>6</sup> and Kathamangalam<sup>8</sup> revealed that the awareness in this regard was 80%, 70% and 75% respectively. Only about 10% of the respondents opined that any plastic bag can be used for waste segregation. The conversation is in contrast with the study conducted in Chennai<sup>13</sup> and Davangere<sup>9</sup> where the corresponding values were 28% and 27% respectively. Only 20% of the respondents agreed that they have not received any training in biomedical waste management. IMAGE is the scheme of Indian medical association Kerala for scientific disposal of biomedical waste. Image provide comprehensive service by providing training to hospital staff for segregation of biomedical waste in color coded bags, collection of it from hospital, transportation in specially designed covered vehicles, scientific treatment and final disposal in the common facility.<sup>9</sup> About 37% were aware about IMAGE However only 25% (n=30) could answer the expansion of the abbreviation IMAGE as Indian Medical Association Goes Ecofriendly.

Regarding the maximum time limit for storage of biomedical waste according to national guidelines about 16% admitted that they are not aware of the time limit and 33% were aware of the fact that it was 48 hours. About 83% of respondents were aware about the symbol of biohazards which is similar to the findings of Madhu Kumar et al.<sup>10</sup> Regarding attitude related questions almost 93% of the respondents opined that the biomedical wastes should be segregated into different categories. The results are similar

to the study conducted by Sood et al in Delhi<sup>6</sup> and Sanjeev et al in Kathamangalam.<sup>8</sup> A very positive attitude towards healthcare waste management is highlighted by the observation that about 83% of the respondent felt that they have knowledge regarding biomedical waste; still 75% of the respondents were interested in receiving further training on the same. This study shows very favorable attitude with no significant relation to educational qualification.

The practice related questions presented a very different picture about 83% respondents were unaware of their institutional tie up with waste management companies. Only 4% of the respondents disposed all kind of waste into general garbage. This result was in contrast with a study conducted by Sudhakar et al in Bangalore where the corresponding figure was 47.6%.<sup>11</sup>

More than 75% of the respondents disposed blood soaked cotton gauze and pharmaceutical wastes in yellow plastic bag. About 75% of respondents disposed waste sharps in white container which is 86% in study conducted by G. Bhagawati et al.<sup>12</sup>

It is an important finding that about 8.3% of the respondents disposed mercury in general garbage. On the other hand about 54.2% of the respondents were aware of proper disposal of liquid waste and 87% respondents knew the biomedical waste can't cross the state border. Regarding proper disposal of gloves and needle disposal score was 70% and about 66% respectively. Very few *i.e.* only 20% of respondents knew about the process of inertisation.

Although post graduate, Technical personal had significantly higher scores than undergraduate students but overall score remained satisfactory.

This study thus throws a light on the existing knowledge, attitude and practice of the health care personnel in tertiary care hospital DRPGMC Tanda in Himachal Pradesh of Northern India. This study shows that there is an urgent need to train health care personnel regarding biomedical waste management. Occupational safety is a prime concern.

## Conclusion

Our study revealed that although the attitude about biomedical waste management was high among the healthcare personnel but the practice was comparatively low. The study indicated that there is a need for creating more awareness among health care personnel regarding biomedical waste management. The topic should compulsory be made a part of undergraduate curriculum or repeated training of biomedical waste management may help to overcome this critical problem.

**Conflict of Interest:** None.

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