



# Biomedical Waste Management: A Study of Knowledge, Attitude, and Practice Among Medical, Dental and Nursing Students in a Teaching College

Mukesh Sharma, Anita Chakravarti, Shobha Broor, Gazala Praveen

## Abstract

**Background:** Bio-medical waste is perilous and can be a health hazard. Medical, dental and nursing graduates spend maximum time during their clinical posting with the patients which increases their chance of exposure and risk related to biomedical waste. Therefore, they need to be aware about biomedical waste management.

**Purpose:** To assess the Knowledge, Attitude and Practices (KAP) regarding biomedical waste management among medical, dental and nursing students. **Material and Methods:** This cross-sectional study was carried out to assess the knowledge and awareness about biomedical waste. The structured self-administered questionnaires were used for data collection. **Results:** Out of the total 300 students enrolled in this study (Group I: Medical, Group 2: Dental, Group 3: Nursing students), 20 medical 13 dental and 23 nursing failed to respond to the questionnaire. MBBS students had more knowledge but better attitude towards BMW management guidelines were seen in nursing students ( $p < 0.001$ ). 86% of the participating candidates had correct knowledge about definition of BMW. Only around 38% of candidates had knowledge of segregation of waste but none had knowledge of correct colour coding. 88% of candidates confirmed that record maintenance was essential but they did lack to answer what kinds of records are important to maintain for biomedical waste management. 94% of the participating candidates said that BMW is teamwork. **Conclusion:** There is a need for rigorous training programme and monitoring for medical students.

## Key Words

Biomedical waste, Hospital waste, Health care workers

## Introduction

Biomedical waste is defined as the waste that is generated during the diagnosis, treatment or immunization of human beings or animals or during the research activities following the production or testing of biological products (1).

Biomedical waste management rules were promoted by Government of India in 1998 and came into effect since January 2003 till date (2). These rules were enacted

to guide the health care workers concerning proper collection, segregation and disposal of health care waste for which the concept of three R's (Recycle, Reduce and Reuse) was validated and is an important step (3).

Out of the total waste produced from a hospital, about 10 - 15% comes in the category of hazardous waste which is potentially harmful to patients, visitors, health care personnel as well as to the public within reach (4). These

Department of Microbiology, Faculty of Medicine and Health Sciences, SGT University, Gurugram, Delhi-NCR, India

Correspondence to : Dr. Mukesh Sharma, Assistant professor, Department of Microbiology, Faculty of Medicine and Health Sciences, SGT University, Gurugram (Delhi-NCR)

Manuscript Received: 19 December 2020; Revision Accepted: 05 May 2020;

Published Online First: 15 September 2020

Open Access at: <https://www.jkscience.org/>

**Copyright:** © 2020 JK Science. This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License, which allows others to remix, transform, and build upon the work, and to copy and redistribute the material in any medium or format non-commercially, provided the original author(s) and source are credited and the new creations are distributed under the same license.

**Cite this article as:** Sharma M, Chakravarti A, Broor S, Praveen G. Biomedical waste management: A study of knowledge, attitude, and practice among medical, dental and nursing students in a teaching college. JK Science 2020;22:141-146.



enacted rules were meant for improving the overall waste management of health care facilities in India. Though, the commencement of these rules was not effective for proper disposal of biomedical waste, the increased global awareness among health care professionals regarding waste hazards and appropriate waste management techniques was not found to be satisfactory in India at the level of awareness (5). The sectors that needed to be improved among the clinical waste management within the hospital include; awareness for proper clinical waste management and training for health care personnel involved in the clinical waste management (6). According to the WHO, lack of awareness regarding the health hazards concerning health care waste, inadequate training in proper waste management, absence of waste management and disposal system, insufficient financial and human resources and the modest attention towards above dimensions are the most common problems connected with the healthcare waste (7).

Medical, dental and nursing graduates spend abundance of their time with patient which increases their chance of exposure and risk related to biomedical waste. Therefore, they need to be well equipped with latest information, skills and practices in managing the hazardous waste apart from reducing hospital acquired infections in order to protect their own health. They are also responsible in a number of ways for preventing the risk due to waste to the other members of health care team and community at large. Hence, this present study was designed to acquire the knowledge and awareness about biomedical waste management among students.

The objective of the study was to assess the Knowledge, Attitude and Practices (KAP) regarding biomedical waste management among students' (medical, dental, nursing graduates) of SGT Medical College and Hospital, Haryana, India. Therefore, the current status among students' awareness regarding biomedical waste management will help the faculty to focus effectively on biomedical waste management training.

### Material and Methods

After attaining the approval from the institutional ethical committee, the structured questionnaires were presented to the students' for assessing their knowledge and practice on biomedical waste management. This prospective cross-sectional study was undertaken by the Department of Microbiology, SGT Medical College and Hospital.

In this present study a total of 300 students were selected on the basis of their courses (100 each, Group I:

Medical students, Group 2: Dental students, Group 3: Nursing students) as they were involved in direct patient care, in managing various healthcare activities and were also responsible for proper disposal of biomedical waste. Prior to this study, before the distribution of questionnaire, the aim and objective of the study were explained to the mentioned students and data were collected. All questions in the questionnaire were close-ended.

All returned questionnaires were coded and analyzed. Same questionnaire was provided to the concordant students after taking the lecture regarding bio medical waste management. Both the results were expressed as a number and percentage of respondents for each question and were analyzed using the SPSS Version 17 software. Chi-square test was performed and the level of significance was set at  $p < .05$ .

### Results

Out of the total 300 students enrolled in this study (Group I: Medical, Group 2: Dental, Group 3: Nursing students), 20 medical 13 dental and 23 nursing failed to respond to the questionnaire. The level of knowledge according to the grouping of student is shown in *Table 1*. It was seen that in the level of knowledge within bio medical waste management, medical and dental students performed better than the nursing students 82.5%, 57.47% and 16.88% respectively. It was surprising to witness that in the field of attitude and practices towards bio medical waste management, nursing students showed excellent result 61.03% and 62.33 respectively as compared to the other groups (*Table 1*).

It was seen that the nursing students had the highest proportion of those following good, average and poor practice respectively as compared to other categories wherein p-value was obtained  $<0.001$ . This implies that there was a significant negative correlation between the type of practice followed and professional category. With the increment of professional level deterioration in the field of attitude towards bio medical waste management was seen.

To analyze whether the level of knowledge was directly proportional to the professional level, p-value was looked over that came up to be 0.002. Hence, there was a significant positive correlation seen in-between knowledge level and professional category. This implies that there was a significant increase in knowledge level as the profession category level increases. It was seen that in the field of attitude towards biomedical waste management, the nursing students had the highest

**Table 1: Distribution of Level of Knowledge, Attitude and Practice according to Different Groups (Pre-Lecture)**

Score Levels	Group I (Medical) n=80 (%)	Group II (Dental) n=87 (%)	Group III (Nursing) n=77 (%)
<b>Level of Knowledge Regarding BMW</b>			
Good	66 (82.5%)	50 (57.47%)	13 (16.88%)
Average	04 (5%)	21 (24.13%)	16 (20.77%)
Poor	10 (12.5%)	16 (18.39%)	48 (62.33%)
<b>Attitude Towards BMW</b>			
Good	33 (41.25%)	26 (29.88%)	47 (61.03%)
Average	11 (13.75%)	17 (19.54%)	21 (27.27%)
Poor	36 (45%)	44 (50.57%)	09 (11.68%)
<b>Practice of BMW</b>			
Good	29 (36.25%)	21 (24.13%)	48 (62.33%)
Average	08 (10%)	14 (16.09%)	17 (22.08%)
Poor	43 (53.75%)	52 (59.77%)	12 (15.58%)

Good: 25 correct answers out of 28; Average: 12-24 correct answers out of 28; Poor: <12 correct answers out of 28

**Table 2: Distribution of Level of Knowledge, Attitude and Practice according to Different Groups (Post Lecture)**

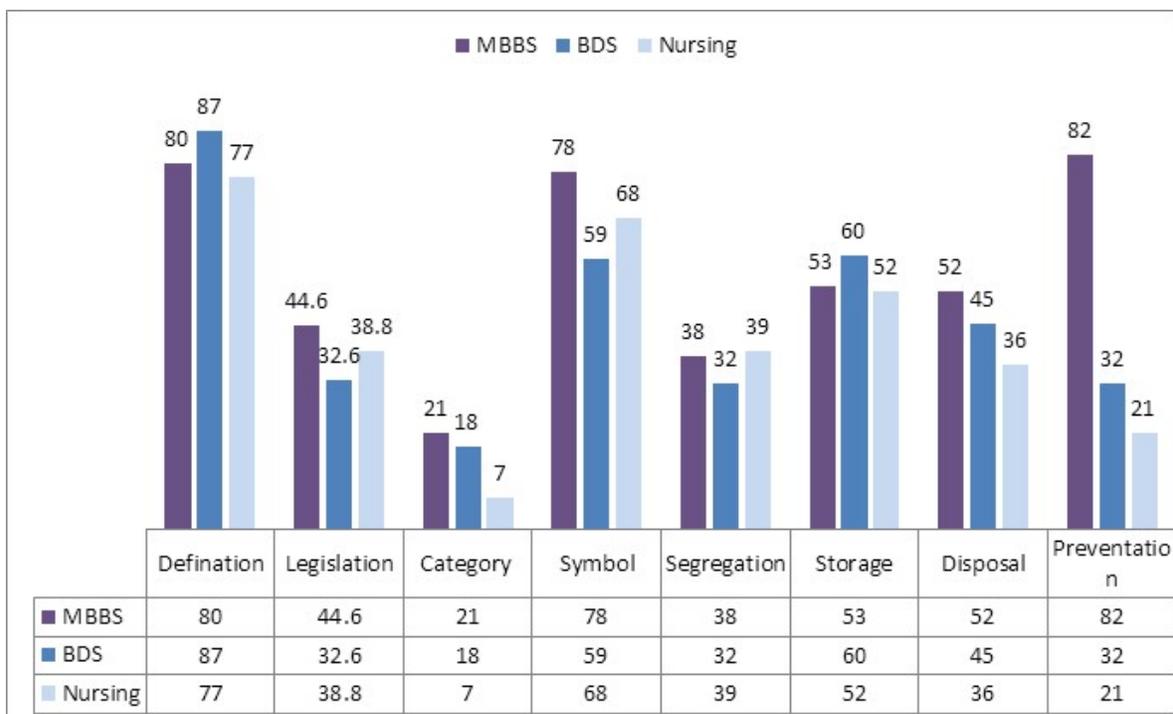
Score Levels	Group I (Medical) n=80 (%)	Group II (Dental) n=87 (%)	Group III (Nursing) n=77 (%)
<b>Level of Knowledge Regarding BMW</b>			
Good	71 (88.75%)	63 (72.41%)	33 (42.85%)
Average	04 (5%)	10 (11.49%)	23 (29.87%)
Poor	05 (6.25%)	14 (16.09%)	21 (27.28%)
<b>Attitude Towards BMW</b>			
Good	44 (55%)	38 (43.67%)	59 (76.62)
Average	15 (18.75%)	29 (33.33%)	11 (14.29%)
Poor	21 (26.25%)	20 (22.99%)	07 (9.09%)
<b>Practice of BMW</b>			
Good	47 (58.75%)	39 (44.83%)	66 (85.71%)
Average	13 (16.25%)	31 (35.63%)	06 (7.8%)
Poor	20 (25%)	17 (19.54%)	05 (6.49%)

Excellent: 25 correct answers out of 28; Good to average: 12-24 correct answers out of 28; Poor: <12 correct answers out of 28

proportion of good, average and poor quantity respectively as compared to other category of students where the p-value obtained was 0.110, which implies no relation between type of attitude and professional category.

To find out the knowledge, attitude and practice increment after the lecture on biomedical waste management, same questionnaires were distributed to the same students' which is illustrated in *Table 2*.

Section-wise distribution of questions with their correct responses given by medical, dental and nursing students is depicted in *Figure 1*. Majority (range: 64.0% - 100.0%) of medical and dental students had better knowledge about BMW definition, bio-hazard symbol and about segregation of BMW as compared to the nursing students. Nursing and dental students had least knowledge about legislation (33% & 39%) its disposal (45% & 36%) and



**Figure 1: Correct Response Cumulative Percentage**

the post-exposure prophylaxis (32% & 21%) after injury. All study enrolled participants agreed that bio-medical waste should be segregated into different categories. Almost every participant felt that BMW management should compulsory be made a part of the undergraduate curriculum. However, Majority (81.0% - 96.0%) medical students and interns hold the idea that they needed further training on BMW management.

### Discussion

The present study was undertaken to assess the awareness about various aspects of biomedical waste management like knowledge, attitude and practices of disposal among medical, dental and nursing students. Improperly disposed hazardous waste pose great infectious risk associated with hospital waste. Theoretically health risk to medical waste handlers from pathogens that may be aerosolized during the compacting, grinding or shredding process that is associated with certain medical waste management or treatment practices is quite commonly seen in hospital associated waste. The impact towards public health is confined to the esthetic degradation of the environment due to careless disposal of hazardous waste and improperly

operated incinerators or other medical waste treatment equipment (8).

Improper waste management can lead to change in microbial ecology and spread of antibiotic resistance among public (9). Medical, dental and nursing students spend abundance of time with patients in the ward and thus, increase their exposure and risk to the hazards present in hospital environment, primarily biomedical waste. The sound knowledge and safe practices among all health care staff need to be strengthened (3).

Nursing staff manages the most work of the hospital activities related with biomedical waste management. Nurses work heavily in various high-pressure departments such as operation theatres, casualties and ICU's. They work deliberately within vulnerable wards with plenty of co-workers throughout the hour. In short, nursing staff forms the backbone of biomedical waste management where they have to give advice, scrutinize the work does by sanitary staff related to bio medical waste segregation, collection and transport.

In the present study, after post lecture out of 80 medical students, 88.75% gave correct answers to knowledge questionnaire, 55% and 58.75% responded well to attitude and practice questionnaire. Of 87 dental



students 72%, 44% and 45% gave correct answers to knowledge, attitude and practice questionnaire respectively. Response of knowledge about biomedical waste management were observed better among medical students as compared to dental and nursing students, while attitude and practice were seen to be better in nursing students when compare to medical and dental students.

As observed from the analyzed data of this present study 129/244 (52.87%) of the students were aware of the definition of BMW and its management before training. The awareness regarding BMW of this study is in agreement with the study of Charania *et al.* (10).

In our study 63% of the students were aware of the disposal of waste into different colour coding bags and 48% of the participants had the knowledge regarding breaking of the needle before disposing it into common bin. Our results were quite similar to the study conducted by Narang *et al.* (11) wherein 88% of the study participants were aware of the disposal of waste into different color-coding bags.

It is of great importance to note that in India there is devoid of ensured legislation towards the proper disposal of sharp waste. Regarding the minimum time limit for the storage of BMW according to standard guidelines, about 63% of participants from the present study were aware of the time limit which is quite contrast to the study conducted by Sanjeev *et al.* (12).

Segregation of waste is the most crucial step for proper management of BMW, as waste segregated into various colour coded containers is finally taken to different sites for disposal which later helps in effective treatment of disposal. The disposal of erroneous waste in wrong colour coded container definitively abolishes the efforts of appropriate disposal of waste. 66% of the students could not response towards the segregation and recycling of solid waste similarly as reported by Ehrampoush *et al.* (13).

70% of the participants in our study had knowledge on post exposure prophylaxis and 33% of the study participants choose to store excess amalgam in fixer solution. Only 45% of the students from this study knew the meaning of legislation in BMW management

Prior training most of the study participants knew the working protocol of BMW, but still many lacked the basic substance regarding BMW. After the training procedure a vast difference was noted among the students who lacked knowledge, attitude and practices towards BMW, confirming that training methodologies helped participants in day to day life around patients and within hospital

environment.

### Conclusion

In our study, we observed that the students had quite good knowledge regarding definition, symbols and prevention of infection through hospital waste while they lacked the knowledge regarding legislation category, segregation storage and disposal. Most of the students were seen to lack the practice in routine however; they were motivated during the training practices, so that they can bring them into their routine practices.

### Recommendations and Suggestions

We recommend there should be proper and intensive regular training programs regarding awareness and practices of waste disposal for all health-care staff, students with continuous monitoring at regular intervals. The findings of this study might help in addressing the issues more appropriately and inform plans for better training programs and monitoring of biomedical waste management systems in hospitals. We hereby recommend a need for rigorous training programme for the students in order to reduce the health hazards associated with biomedical waste products.

### Financial Support and Sponsorship

Nil.

### Conflicts of Interest

There are no conflicts of interest.

### References

1. Sharma AK. Bio-medical waste (management and handling) rules, 1998. Suvidhalaw House, Bhopal.
2. Sunil Kumar VC, Manjunatha M, Badami V, Pradeep PR. Biomedical waste management: A review. *J Oral Health Comm Dent* 2012;6:141-44.
3. Glenn Mc R, Garwal R. Clinical waste in developing countries. An analysis with a case study of India and a critique of the basle TWG guidelines (1999).
4. Safe management of waste from health care activities. WHO, Geneva; 1999
5. Sudhir KM, Chandu GN, Prashant GM, Nagendra J, Shafiulla M<sup>2</sup>, Reddy VV. Awareness and practices about dental health care waste management among dentists of Davangere City, Karnataka. *J Indian Assoc Public Health Dent* 2006;4:44-50.



6. Kwikiriza S, Stewart AG, Mutahunga B, Dobson AE, Wilkinson E. A whole systems approach to hospital waste management in rural Uganda. *Front Pub Heal* 2019;6:136.
7. Anozie OB, Lawani LO, Eze JN, Mamah EJ, Onoh RC, Ogah EO, Umezurike DA, Anozie RO. Knowledge, attitude and practice of healthcare managers to medical waste management and occupational safety practices: Findings from Southeast Nigeria. *J Clin Diagn Res* 2017;11:1-4.
8. Hedge V, Kulkarni RD, Ajantha GS. Biomedical waste management. *J Oral Maxillofac Pathol* 2017;11:5-9.
9. Singer AC, Shaw H, Rhodes V, Hart A. Review of antimicrobial resistance in the environment and its relevance to environmental regulators. *Front Microbiol* 2016;7:17-28.
10. Charania ZK, Ingle NA. Awareness and practices of dental care waste management among dental practitioners in Chennai City. *J Contempo Dent* 2011;1:1.
11. Narang RS, Manchanda A, Singh S, Verma N, Padda S. Awareness of biomedical waste management among dental professionals and auxiliary staff in Amritsar, India. *Oral Health Dent Manag* 2012;11(4):162-68.
12. Sanjeev R, Kuruvilla S, Subramaniam R, Prashant PS, Gopalakrishnan M. Knowledge, attitude, and practices about biomedical waste management among dental healthcare personnel in dental colleges in Kothamangalam: A cross-sectional study. *Health Sci* 2014;13:1-12.
13. Mazloomi SS, Baghianimoghadam MH, Ehrampoush MH, Baghianimoghadam B, Mazidi M, Mozayan MR. A study of the knowledge, attitudes, and practices (KAP) of the women referred to health centers for cardiovascular disease (CVDs) and their risk factors. *Health Care Women Int* 2014;35:50-59.