Library Progress International
Vol.45 No.2, Jul-Dec 2025: P. 346-352

Print version ISSN 0970 1052
Online version ISSN 2320 317X

Original Article

Available online at www.bpasjournals.com

A study to assess the knowledge and practice of Biomedical Waste Management among the dental students at private dental college in Ahmedabad

Dr. Diptesh S. Rami[1], Dr. Chirag Chauhan[2], Dr. Bhagyashree Shreyansh Sutaria[3]

[1] PhD Scholar, Gujarat University, Lecturer, Department of Prosthodontics, crown & bridge, AMC Dental College and Hospital, Khokhara, Ahmedabad, Gujarat
Email id: dipteshrami1989@gmail.com, ORCID ID: 0000-0003-0451-9187

[2] PhD Guide, Gujarat University, Professor, Department of Prosthodontics and Crown and Bridge, Ahmedabad Dental College and Hospital, Bhadaj, Ahmedabad, Gujarat
Email id: drchauhan2007@rediffmail.com, ORCID ID: 0000-0001-5358-8686

[3] Associate Professor, Department of Prosthodontics and Crown and Bridge, Siddhpur Dental College and Hospital, Dethali, Siddhpur, Gujarat
Email ID: bhagyadave91@gmail.com, ORCID ID: 0009-0007-4281-2073

How to cite this article: Dr. Diptesh S. Rami, Dr. Chirag Chauhan, Dr. Bhagyashree Shreyansh Sutaria (2025) A study to assess the knowledge and practice of Biomedical Waste Management among the dental students at private dental college in Ahmedabad. *Library Progress International,* 45(2), 346-352

Abstract:

Introduction: Biomedical waste (BMW) management is a critical aspect of healthcare, particularly in dental settings, due to the potential risks of infection and environmental hazards. Despite guidelines, inadequate adherence to proper BMW handling is common. This study evaluates the knowledge and practices related to BMW management among dental students at a private dental college in Ahmedabad.

Materials and Methods: A cross-sectional study was conducted with 161 undergraduate dental students (third year, final year, and interns). A validated 20-question survey assessed students' knowledge and practices. Knowledge was categorized as poor, moderate, good, or excellent, and practices were similarly evaluated. Statistical analysis was done using One-Way ANOVA and chi-square tests.

Results:Third-year students had the lowest knowledge, with 35.4% scoring poorly, while interns had the highest levels, with 32.8% showing excellent practice. Statistically significant differences in knowledge and practice levels were found between academic years ($p < 0.05$). A strong positive correlation ($r = 0.82$) was observed between knowledge and practice.

Discussion: The results indicate that knowledge and practice of BMW management improve with academic progression, aligning with findings from similar studies. The need for consistent training and reinforcement of BMW protocols is crucial to enhancing compliance and safety among dental students.

Conclusion: BMW management knowledge and practice significantly improve as students advance in their academic careers. Continuous education on BMW protocols is essential to prepare students for effective waste management in professional practice.

Key words: Biomedical Waste Management, Dental students, Knowledge, Practice

Introduction

The healthcare industry is a leading global sector and is rapidly expanding in India. This growth is driven by factors such as increased life expectancy, higher health awareness, and a rise in lifestyle-related diseases. India's healthcare sector encompasses corporate hospitals, private clinics, and medical and dental colleges, all of which produce biomedical waste. This waste includes human and animal anatomical materials, medical devices like syringes and needles, and various other materials used during diagnosis, treatment, and research. Biomedical waste is generated in hospitals, nursing homes, blood banks, and pathological laboratories during the diagnosis, treatment, or immunization of various diseases.[1]

According to the WHO, 85% of hospital waste is non-hazardous, approximately 10% is infectious, and the remaining 5% is non-infectious.[2] Considering various factors like the amount of blood, saliva, and tissue extracted during surgery, the infectivity of pathogens, and the clinical conditions of both the patient and the operator, in addition to the safety precautions taken before, during, and after treatment, it is essential to follow protocols for handling biological waste. It's crucial to acknowledge that all patients attending dental outpatient departments should be treated as potential carriers of infectious diseases due to the abundance of pathogenic microorganisms found in the oral cavity.[3,4,5] An essential requirement for a waste management program to succeed is segregation, which entails categorizing waste based on how it needs to be treated and disposed of. Waste should be separated and gathered at its origin in distinct containers to guarantee each type receives suitable treatment, rendering it safe. Effective waste management involves managing waste at all stages, from its creation to its ultimate disposal.[6]

Dental schools, acting as hubs for professional training and healthcare provision to the community, are tasked with the duty to prevent diseases and reduce environmental hazards linked to waste produced during clinical procedures.[7,8,9] Everyone involved in various stages, from the creation to the disposal of biomedical waste, faces potential risks of severe health consequences. This group encompasses doctors, nurses, assistants, hospital staff, and workers responsible for handling and disposing of such waste. Healthcare institutions should enforce stringent rules and regulations along with comprehensive staff training. However, due to the lack of adherence to regulations and insufficient training provided to healthcare personnel, there is indiscriminate disposal of biomedical waste.[10]

Therefore, it is vital to provide emerging professionals not only with the abilities to diagnose and treat illnesses but also to foster understanding of various public health and environmental concerns. Promoting intervention programs is an effective strategy for increasing awareness and comprehension of recycling and reusing biomedical waste. Given this context, this study aimed to evaluate the knowledge and attitude, and practices concerning biomedical waste management among undergraduate students at a dental college.

Materials and Methods:

A cross-sectional study was carried out among undergraduate dental students at Ahmedabad Dental College, Gujarat. A total of sample size of 161 students, those in their third year, final year, and internship, were selected for. This questionnaire was developed following an extensive review and underwent validation by five experts. Prior to the main study, a pilot survey was conducted to ensure respondent reliability, yielding a Cronbach's alpha value of 0.78. All students voluntarily completed a questionnaire comprising 20 closed-ended

questions. These questions encompassed 12 question related to knowledge and awareness and 8 related to practices, aiming to evaluate the students' understanding and behaviors regarding biomedical waste (BMW) management. The student roster was acquired from the student section, and with prior authorization from the appropriate authorities, students were assembled in the lecture hall. Subsequently, questionnaires were distributed to students according to their academic year, and responses were collected on the same day. For each correct answer, a score of 1 was assigned, and for each incorrect answer, a score of 0 was given. A total score of 75% and above was considered excellent, between 50% and 75% was good, between 25% and 50% was moderate, and below 25% was poor knowledge. Similarly, the students' practices regarding BMW management were also graded based on their responses adapted from (Kumar S, Rahman R 2017).[11] Statistical analyses of knowledge, awareness, and practices were conducted using descriptive statistics and One-Way Analysis of Variance (ANOVA) at a 95% significance level. Data management and statistical analysis were performed using SPSS version 23.0 (SPSS Inc., Chicago, USA).

Results:

Table 1: Respondents' knowledge levels concerning biomedical waste (BMW) management

Level of Knowledge	Academic Year			Total (%)
	Third Year (%)	Final Year (%)	Interns (%)	
Poor	17 (35.4%)	20 (40.81%)	16 (25%)	53
Moderate	12 (25%)	8 (16.32%)	21 (32.8%)	41
Good	11 (22.9%)	12 (24.48%)	17 (26.56%)	40
Excellent	8 (16.66%)	9 (18.36%)	10 (15.62%)	27
Total	48	49	64	161
Chi Sq (p value)	28.19 (0.001)			

Among the third-year students, 35.4% have poor knowledge of BMW management, 25% possess moderate knowledge, 22.9% have good knowledge, and 16.66% exhibit excellent knowledge. For final-year students, 40.81% have poor knowledge, 16.32% have moderate knowledge, 24.48% have good knowledge, and 18.36% demonstrate excellent knowledge. Among the interns, 25% show poor knowledge, 32.8% have moderate knowledge, 26.56% have good knowledge, and 15.62% possess excellent knowledge. The tables suggest an improvement in knowledge as students advance in their academic careers and practical experience. The chi square test of association shows that there is significant association between the level of knowledge and the year of study.

Table 2: Mean Knowledge Score among the three groups using One way ANOVA

Year of Study	Mean	SD	Minimum	Maximum
Third Year	7.56	2.45	4	9
Final Year	8.23	2.07	5	9
Intern	9.18	1.04	7	10
F value (p value)	67.18 (0.003)			

The mean knowledge score for third-year students is 7.56, with a standard deviation (SD) of 2.45, and scores ranging from 4 to 9. Final-year students have a higher mean score of 8.23, with an SD of 2.07, and their scores range from 5 to 9. Interns exhibit the highest mean score of 9.18, with a much smaller SD of 1.04, and their scores range from 7 to 10. The p value being less than 0.05 indicates that there are statistically significant differences in the mean knowledge scores among the three groups. This suggests that the knowledge of BMW management significantly improves as students' progress from third year through to their internship.

Table 3: Respondents' practice levels concerning biomedical waste (BMW) management				
Level of Practice	**Academic Year**			**Total (%)**
	Third Year (%)	**Final Year (%)**	**Interns (%)**	
Poor	18 (37.5%)	18 (36.73%)	10 (15.62%)	46
Moderate	9 (18.75%)	7 (14.28%)	13 (20.31%)	29
Good	10 (20.83%)	15 (30.61%)	20 (31.25%)	45
Excellent	11 (22.91%)	9 (18.36%)	21 (32.8%)	41
Total	48	49	64	161
Chi Sq (p value)	45.18 (0.0131)			

For third-year students, 37.5% have poor practice levels in BMW management, 18.75% have moderate practice levels, 20.83% demonstrate good practice levels, and 22.91% exhibit excellent practice levels. Among final-year students, 36.73% have poor practice levels, 14.28% have moderate practice levels, 30.61% demonstrate good practice levels, and 18.36% exhibit excellent practice levels. For interns, 15.62% show poor practice levels, 20.31% have moderate practice levels, 31.25% demonstrate good practice levels, and 32.8% exhibit excellent practice levels. The chi square test of association depicts statistical significance showing that there is association between the year of response and the level of practice.

Table 4: Mean Practice Score among the three groups using One way ANOVA				
Year of Study	**Mean**	**SD**	**Minimum**	**Maximum**
Third Year	6.18	1.92	4	7
Final Year	7.43	2.11	5	9
Intern	8.91	1.04	7	9
F value (p value)	42.92 (0.014)			

The mean practice score for third-year students is 6.18, with a standard deviation (SD) of 1.92, and scores ranging from 4 to 7. For final-year students, the mean score is higher at 7.43, with an SD of 2.11, and scores ranging from 5 to 9. Interns have the highest mean practice score of 8.91, with a smaller SD of 1.04, and scores ranging from 7 to 9. The F value from the one-way ANOVA test is 42.92, and the associated p value is 0.014. The p value being less than 0.05 indicates that there are statistically significant differences in the mean practice scores among the three groups.

Table 5: Correlation between Knowledge and Practice	
Pearson Correlation Coefficient	**Practice**
Knowledge	0.82
P value	0.018
N	161

The Pearson correlation coefficient between knowledge and practice is 0.82, indicating a strong positive correlation. This suggests that as knowledge about BMW management increases, practice levels also tend to improve significantly. (p value less than 0.05 indicating statistically significant correlation)

Discussion

The management of biomedical waste (BMW) is a critical aspect of healthcare, particularly in dental settings where the generation of waste is a significant concern. A systematic review of studies on BMW management among dental teaching institutions and private practitioners highlighted the importance of effective BMW management in preventing hazards and fulfilling social responsibilities.[12] The review emphasized the need for timely training and sensitization

programs for dentists and auxiliary staff on BMW guidelines, as well as strict implementation and monitoring of BMW rules in health institutions. The present study was conducted to assess the present level of knowledge and practice among the dental students at the private dental college in Ahmedabad. A study by Khubchandani K, Devi KM, Gunasekaran S, Yeturu SK, Ramanarayanan V on the knowledge, attitude, and practices of BMW management among clinical dental students in a teaching hospital in India found that while students had a positive attitude towards safe BMW management, their knowledge and practice in this area required improvement.[13] The present study categorized the knowledge and practice into poor, moderate, good and excellent. The study revealed that the level of student in terms of knowledge and practice improved as they advance to higher year of study. This finding corroborated with the findings of another study conducted by Janani K and Jayaraman M. which examined the knowledge, awareness, and practice of BMW segregation among dental offices, finding that dentists with more than 10 years of experience in dentistry possessed significantly increased awareness regarding BMW segregation.[14] A cross-sectional study assessing the knowledge, attitude, and practice of BMW management among dental practitioners in Ghaziabad, India, reported a positive attitude towards safe BMW management among the majority of participants.[15] Similarly, a study assessing knowledge and awareness about BMW management among undergraduate students, residents, and nursing staff in a dental college found that while there was a positive attitude towards BMW management, there were gaps in knowledge and practice that needed to be addressed.[16]

The present highlights a strong positive correlation between the knowledge and practice among the dental students. The correlation between knowledge and practice regarding biomedical waste (BMW) management among dental students is a crucial aspect of ensuring proper waste disposal and minimizing health risks in dental settings. Studies have shown that while dental students generally possess a positive attitude towards safe BMW management, there are significant gaps in their knowledge and practice of BMW segregation and disposal. Previous study by Khandelwal V, Khandelwal S, Thakur JS have noted varying levels of awareness and practice among the dentists indicating low correlation among the dental professionals.[17] The studies suggest that while dental students and professionals may have a general understanding of the importance of BMW segregation, there is a need for continuous educational programs and monitoring to ensure correct disposal of wastes.[18-20]

The present study expresses an alarming need to create knowledge and awareness among the dental students regarding the biomedical waste management. The dental students knowledge and practice should be reviewed periodically on this important subject matter. A structured checklist should be prepared for assessing the practice of BMW guidelines during the management of patient. These suggestions were also provided to the site of the study after communicating the results.

The present study is limited to one dental college in Ahmedabad and students of the dental college. Future studies encompassing the different socio-demographic variables, dental practitioners should be conducted.

Conclusion:

The study reveals that both knowledge and practice of biomedical waste (BMW) management improve significantly as students progress from their third year to their internship. Third-year students show lower levels of knowledge and practice, while interns exhibit the highest levels. Statistical analyses confirm these improvements are significant. Additionally, there is a strong positive correlation between knowledge and practice, indicating that better knowledge leads to improved practices. Overall, the findings highlight the importance of enhancing educational initiatives to improve BMW management among healthcare students.

Reference

1. Ranjan R, Pathak R, Singh DK, Jalaluddin M, Kore SA, Kore AR. Awareness about biomedical waste management and knowledge of effective recycling of dental materials among dental students. J Int Soc Prev Community Dent. 2016;6(5):474-9.
2. Puri S, Smriti K, Pentapati KC, Singh R, Vineetha R, Tamrakar A. Assessment of awareness about various dental waste management practices among dental students and practicing clinicians. Pesquisa Brasileira em Odontopediatria e Clínica Integrada. 2020;19:e4839.
3. Sood AG, Sood A. Dental perspective on biomedical waste and mercury management: a knowledge, attitude, and practice survey. Indian J Dent Res 2011;22(3):371-5.
4. Cayo-Rojas C, Briceño-Vergel G, Córdova-Limaylla N, Huamani-Echaccaya J, Castro-Mena M, Lurita-Córdova P, Bermúdez-Mendoza J, Allen-Revoredo C, Torres-Vásquez J, Ladera-Castañeda M. Impact of a virtual educational intervention on knowledge and awareness of biomedical waste management among Peruvian dental professionals. Sci Rep 2023;13(1):22346.
5. Bizzoca ME, Campisi G, Muzio LL. Covid-19 pandemic: What changes for dentists and oral medicine experts? A narrative review and novel approaches to infection containment. Int J Environ Res Public Health 2020;17(11):3793.
6. Denault D, Gardner H. OSHA Bloodborne Pathogen Standards. [Updated 2023 Jul 20]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from https://www.ncbi.nlm.nih.gov/books/NBK570561/ as accessed on 4th Feb 2023.
7. Duane B, Dixon J, Ambibola G, Aldana C, Couglan J, Henao D, et al. Embedding environmental sustainability within the modern dental curriculum- Exploring current practice and developing a shared understanding. Eur J Dent Educ 2021;25(3):541–9.
8. Mulligan S, Smith L, Martin N. Sustainable oral healthcare and the environment: challenges. Dent Update 2021;48(6):493–501.
9. Diaz-Soriano A, Gallo W, Luza S, Munive-Degregori A, Bocanegra R, Mayta-Tovalino F. Knowledge and awareness of effective recycling of dental materials and waste management among Peruvian undergraduate students of dentistry: a logistic regression analysis. J Int Soc Prev Community Dent. 2020;10(3):309-315.
10. Singh T, Ghimire TR, Agrawal SK. Awareness of biomedical waste management in dental students in different dental colleges in Nepal. Biomed Res Int. 2018; 2018:1742326.
11. Kumar S, Rahman R. Knowledge, awareness, and practices regarding biomedical waste management among undergraduate dental students. Asian J Pharm Clin Res 2017;10(8):341
12. Tompe PP, Pande NA, Kamble BD, Radke UM, Acharya BP. A Systematic Review to Evaluate Knowledge, Attitude, and Practice Regarding Biomedical Waste Management among Dental Teaching Institutions and Private Practitioners in Asian Countries. J Int Soc Prev Community Dent. 2020 ;28;10(5):531-539.
13. Khubchandani K, Devi KM, Gunasekaran S, Yeturu SK, Ramanarayanan V. Knowledge, attitude, and practices of biomedical waste management among clinical dental students. J Global Oral Health 2020;3(2):110-7.
14. Janani K, Jayaraman M. Knowledge, awareness, and practice of biomedical waste segregation in a dental office. J Adv Pharm Technol Res. 2022 Nov;13(Suppl 1):S1-S5.
15. Ananthalekshmy R, Patthi B, Singla A, Malhi R, Kumari M, Muchhal L. "Knowledge, Attitude, and Practice about Dental Waste Management among Dental Practitioners in Ghaziabad - A Questionnaire Based Cross-Sectional Study", IJDSIR- 2020;3(5):572 – 583.

16. Choudhary M, Verma M, Ghosh S, Dhillon JK. Assessment of Knowledge and Awareness About Biomedical Waste Management among Health Care Personnel in a Tertiary Care Dental Facility in Delhi. Indian J Dent Res 2020; 31(1): p 26-30.
17. Khandelwal V, Khandelwal S, Thakur JS. Health care waste disposal among private dentist in an Indian city: It's time to act. Int J Infect Control. 2013; 9:1–5.
18. Dehal A, Vaidya AN, Kumar AR. Biomedical waste generation and management during COVID-19 pandemic in India: Challenges and possible management strategies. Environ Sci Pollut Res Int. 2022; 29:14830–45.
19. Sabbahi DA, El-Naggar HM, Zahran MH. Management of dental waste in dental offices and clinics in Jeddah, Saudi Arabia. J Air Waste Manag Assoc. 2020;70:1022–9.
20. Singh BP, Khan SA, Agrawal N, Siddharth R, Kumar L. Current biomedical waste management practices and cross-infection control procedures of dentists in India. Int Dent J. 2012;62:111–6.