ORIGINAL ARTICLE

Assessment of Knowledge of Bio Medical Waste Management in Third and Final Year BDS Students

Akhtar Ali[*], Anusha Qureshi[**], Syeda Mahnoor[***], Farah Ahmad[*]

[*]Department of Health Care Management, Ziauddin University, Karachi
[**]Department of Oral Pathology, LUMHS, Jamshoro
[***]Ziauddin Medical College, Ziauddin University, Karachi

Abstract

Background
Healthcare activities generate wastes of various quality and quantity. The waste varies from being hazardous to non-hazardous for the healthcare workers. The risk of infection amongst the medical personnel and staff, especially dental surgeons, increases with the inadequate management of the biomedical waste disposal. The data regarding proper biomedical waste disposal (BMW) is almost scarce across Pakistan.

Methodology
Across-sectional study was conducted amongst the third year and final year dentistry students of Liaquat University of Medical and Health Sciences Jamshoro, to gauge their knowledge of proper waste disposal methods. A questionnaire based Performa was prepared for the students. Total of 107 students participated in it. The data was recorded and analyzed using SPSS version 20. Chi-square test was applied to compare the data and p-value less than 0.05 was considered significant.

Results
Out of 107 students, 56 were from third year and 51 from final year. It was found that majority of students in both years lacked knowledge if their college followed the BMW guidelines or not. Most of the students also lacked knowledge about the BMW segregation categories.

Conclusion
Lack of knowledge in proper waste disposal among health care workers who are directly involved in generating and disposing medical waste is a serious concern. To overcome this challenge knowledge regarding BMW management should be part of the curriculum that needs to be taught and practiced at all levels of undergraduate education.

Keywords
Biomedical waste, Knowledge, Attitude, BDS students

Introduction

Health care activities generate wastes that includes a vast spectrum of materials, from used sharps to soiled dressings, body parts, diagnostic samples, blood, chemicals, pharmaceuticals, medical devices and radioactive materials. Inadequate management of health care waste potentially exposes doctors, dental surgeons, technicians, housekeeping, patients and the community at large to infections, toxins injuries, but also endanger the environment. To minimize the impact of such wastes all medical waste materials should be segregated, treated, and then disposed off safely.[1,2] The biomedical wastes is categorized into hazardous waste and non-hazardous waste. The non-hazardous waste makes 75-90% of the total whereas the remaining 10-25% is hazardous waste. The hazardous waste is injurious to human health and environment. Due to this reason the handling of biomedical waste requires proper sorting, discarding, and disposing from the health care facilities.[3,4] The World Health Organization reports, approximately 8 to 16 million new cases of Hepatitis B virus (HBV), 2.3–4.7 million cases of Hepatitis C virus (HCV) and 80,000–160,000 cases of Human Immunodeficiency Virus (HIV) each year, due to unsafe injections disposal and inappropriate medical waste disposal. In the dental clinic, the waste generated is hazardous waste that includes disposable syringes, needles, blades, blood-soaked dressings and cottons, mercury and other materials used in fillings, Root canal filling (RCT) files etc. The proper disposal of this waste is important as mercury and sharps are hazardous to environment and individuals if disposed off untreated into open water.[5-7]

The research in Pakistan on this important problem is scarce, and there is a lack of knowledge, planning and execution of standard procedures in biomedical waste management. Although health-care facilities should follow the provisional guidelines for proper waste disposal but due to lack of resources and effective monitoring BMW has become a challenge.[8,9] In order to curb this problem, all the HCW including medical students and house officers need to have sufficient knowledge. This research was conducted to understand the knowledge of young and aspiring to be dentists on the topic of BMW disposal.

Methodology

It was a cross sectional study conducted from January-March 2021 in the Institute of Dentistry, Liaquat University of Medical and Health Sciences, Jamshoro. The target population was

Corresponding Author: Akhtar Ali,
Department of Health Care Management,
Ziauddin University, Karachi, Pakistan
Email: akhtar.ali@zu.edu.pk

students of third year and final year BDS. The calculated sample as at 50% proportion of each batch was 35 students per batch. The sample was recruited by simple randomization. The questionnaire (which included questions regarding demographic data and biomedical waste management in dental OPD) was developed and validated by conducting a pilot on 20 students. After taking written consent research objectives were shared with the students and questionnaire was circulated. Data was entered on SPSS version 20. Chi-square test was applied as test of significance and p-value less than 0.05 was considered as significant at 95% confidence interval.

Result

The study had 107 participants, of which 56 (52.3%) were from third year BDS and 51 (47.7%) were from final year BDS. Male to female ratio was 60 (56.1%) males and 47 (43.9%) females. Detailed results are shown in table 1.

Discussion

Proper knowledge regarding BMW is essential to protect the community and environment from its harmful effects.[10] This study was conducted on the medical students of the Institute of Dentistry, Liaquat University of Medical and Health Sciences Jamshoro to understand their knowledge on the subject. This study revealed that the awareness and proper practice of biomedical waste management was not satisfactory. Majority of the students understood the need for proper waste disposal and wanted this to be taught formally during their training.

Table 1: Responses of students regarding biomedical waste disposal and its hazards

Questions	3rd year BDS N=56		Final year BDS N=51		p-value
	Yes F (%)	No F (%)	Yes F (%)	No F (%)	
Do you know about Biomedical waste?	28 (50)	28 (50)	21 (41.2)	30 (58.9)	0.66
Have you been taught regarding management of BMW during graduation?	17 (30.4)	39 (69.7)	4 (7.8)	47 (92.2)	0.010*
Does your college/hospital have BMW guidelines to follow?	12 (21.4)	44 (78.6)	1 (2)	50 (98)	0.006*
Is the biomedical waste in your hospital segregated according to different categories?	9 (16.1)	47 (83.9)	0 (0)	51 (100)	0.009*
Does your clinical setup follow color coding for BMW discarding?	6 (10.7)	50 (89.3)	1 (2)	50 (98)	0.37*
Are the used needles immediately discarded?	45 (80.4	11 (19.6)	36 (70.6)	15 (29.4)	0.195
In your opinion is a used dental x-ray film is a hazardous waste?	5(44.6)	31(55.4)	29 (56.9)	22 (43.1)	0.436
Is there a proper method of x-ray film disposal at the hospital?	15 (26.8)	41 (73.2)	3 (5.9)	48 (94.1)	0.006*
Do you wash the hands after each waste disposal?	46 (82.1)	10 (17.9)	42 (82.4)	9 (17.6)	0.981
Is it your responsibility to manage the waste according to guidelines?	47 (83.9)	9 (16.1)	44 (86.3)	7 (13.7)	0.531
Do you think improper management of BMW has a role in spread of infections in community?	49 (87.5)	7 (12.5)	46 (90.2)	5 (9.8)	0.046*
Do you think the college or hospital should arrange separate classes or continuing medical education to educate medical healthcare professionals about the biomedical waste disposal management?	48(85.7)	8 (14.3)	44 (86.3)	7 (13.7)	0.009*

*significant p-value

However, the knowledge on segregating the waste and its proper disposal was utterly lacking. Students were well aware of importance of hand hygiene and proper disposal of sharps but were unaware of other potentially biohazardous waste that was generated during their practice and its disposal. Also lacking was the understanding of hospital waste management. Dental waste is important contributor of hazardous BMW. It includes various materials like sharp needles, human tissue including extracted teeth, blood, saliva and toxic chemical waste like mercury and silver amalgam which if disposed improperly endangers the environment and exposes to blood borne infections.[11] Since a research targeting the knowledge and assessment of future dentists regarding BMW was not done in Pakistan, key strength of this study is to provide information and to push the academia to include such critical topic in the curriculum.

Knowledge and Awareness:
More than 50% of students from both third and final year inadequately knew about the BMW. However, the third year students demonstrated better knowledge on the subject than the final year students. Our results suggest that majority of the third and final year students (69.7% and 92% respectively) reported not being taught about the management of BMW during graduation. This is a common practice observed in developing countries like India, Brazil and Bangladesh where the curriculum lacks guidance and information about the management[6] as a study by Narang et al also suggest that the dental students lack the awareness regarding BMW management.[12]

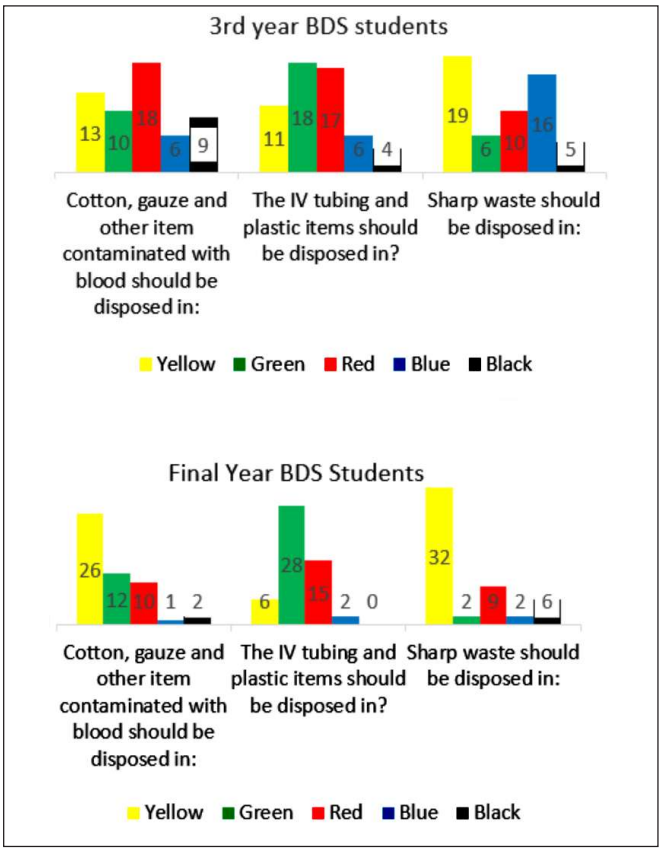

Fig 1. Shows the knowledge of third year and final year students regarding color coding system of biomedical waste disposal.

Practice and Attitude to the BMW management at their institute:
98% of final year and 78.6% of the third year students from our study reported that their college does not have any BMW guidelines that are followed during waste disposal. However, WHO guidelines mandates that every staff of each hospital should have adequate knowledge and training on waste management.[11,13] Inadequate knowledge in handling, transportation and disposal of waste is due to lack of proper training on the subject. Color coding for segregation of waste which is an essential step in waste management, 84 to 98% students expressed that their respective clinical setup does not follow a color coding, their own knowledge on the subject was also very poor (figure 2). This is in accordance to another research done in India where it was reported that health care workers were unaware of disposal of wastes.[14,15] Sharp objects such as needles, syringes, and used ampoules are one of the leading cause of injuries and transmission of diseases to the waste collectors and the disposal handlers.[16,17] Knowledge regarding needle and sharps disposal, was appropriate in majority (80 & 70%) of third and final year students. This is in coherence with a study conducted in Lucknow whose data show that 97% of the dental practitioners knew and were safe from needle disposal techniques.[18] Majority of the students of both third and final year (45 and 57%) also considered dental x-ray to be a huge hazardous waste but sadly 73-94% reported that there was no way to discard such films. This is relatively a very low percentage of future dental practitioners knowing and taking precautions and adhering to protocols with dental radiology.[19]

Approach to the BMW:
Regarding their personal attitudes about safety, around 80% students from both batches were positive in hand washing after every disposal and considered (82 % from third year and final year) their responsibility to manage the waste. Our study shows that majority of the students do consider improper management of BMW has a key role in spreading of infections. Moreover, students positively agreed that their institutes should keep separate classes on BMW education. The willingness of students to be taught regarding BMW management can help in overcoming the problem. It is our responsibility to improve the current curriculum with the recent advances in wastes\disposal and its practical application.[20,21]

Conclusion
Students of third year and final year BDS at our setting do not have sufficient knowledge regarding BMW. Their clinical setting does not follow color coding system for BMW therefore

COLOUR	WASTE DESCRIPTION
YELLOW*	Human tissues, organs, body parts, items contaminated by blood/body fluids, soiled cotton & dressing, soiled plaster casts etc.
RED*	Catheters, tubes, cannulae, syringes, plastic IV bottles & sets, used gloves, infected plastics, specimen containers, lab waste, microbiology cultures, used or discarded bags of blood/blood products, vaccines etc.
BLUE*	Glass items, needles, syringes, scalpels, blades, used and unused sharps etc.
BLACK*	Discarded medicines, discarded cytotoxic drugs etc.
GREEN	General waste, non-infected plastic materials & papers, disposables, cardboards, metal containers, office waste, food waste etc.

Fig 2. Key for the biomedical waste disposal.[6]

students do not have the knowledge about waste management. According to their responses they have not been taught regarding BMW management. From this study we also understood the willingness of students to learn about safe waste disposal techniques and their concern about personal and environmental safety.

Future recommendations

Courses regarding BMW management should be included in the curriculum of medical and dental students. Studies at larger scale are recommended to identify the gap of knowledge among health care workers. This will help the higher authorities in policy development as well as it will help in preventing the spread of infectious diseases.

References

1. Mathur P, Patan S, Shobhawat ASJCWE. Need of biomedical waste management system in hospitals-An emerging issue-a review. *Current World Environment* 2012;7(1):117.
2. Alam I, Alam G, Ayub S, Siddiqui AA. Assessment of bio-medical waste management in different hospitals in Aligarh city. In Advances in waste management 2019 (pp. 501-510).
3. Pullishery F, Panchmal GS, Siddique S, Abraham AJIAIM. Awareness, knowledge and practices on bio-medical waste management among health care professionals in Mangalore-A cross sectional study. *Int Arch Integr Med* 2016;3(1):29-35.
4. Soyam GC, Hiwarkar PA, Kawalkar UG, Soyam VC, Gupta VKJIJCMPH. KAP study of bio-medical waste management among health care workers in Delhi. *Int J Community Med Public* 2017;4:3332-7.
5. Singh RD, Jurel SK, Tripathi S, Agrawal KK, Kumari RJBRI. Mercury and other biomedical waste management practices among dental practitioners in India. *BioMed Research International* 2014;2014.
6. Singh T, Ghimire TR, Agrawal SKJBri. Awareness of biomedical waste management in dental students in different dental colleges in Nepal. *BioMed Research International* 2018;2018.
7. Datta P, Mohi GK, Chander JJJolp. Biomedical waste management in India: Critical appraisal. 2018;10(1):6.
8. Ali S, Mahmood U, Malik AU, Aziz F, Naghman RB, Ahmed IJPH, *et al*. Current hospital waste management practices in Pakistan: Case study and curative measures. *Public Health Prevent Med* 2015;1(3):125-9.
9. Khan K, Shaheen S, Iqbal H, RohinaArif GMR, Khalil M, Munawaa A, *et al*. 29. Assessment of waste management practices in hospitals of Islamabad and Abbottabad-Pakistan. *Pure and Applied Biology* 2020;9(1):282-9.
10. Dey P, Das BJJoMS. Knowledge, attitude, and practices about biomedical waste management as per 2016 rules among resident doctors and nursing staff in a tertiary care specialty hospital: A cross-sectional study. *J Medical Society* 2020;34(1):31.
11. Vlachokostas C, Michailidou A, Achillas CJR, Reviews SE. Multi-Criteria Decision Analysis towards promoting Waste-to-Energy Management Strategies: A critical review. Renewable and Sustainable Energy Reviews 2020:110563.
12. Narang RS, Manchanda A, Singh S, Verma N, Padda SJOh. Awareness of biomedical waste management among dental professionals and auxiliary staff in Amritsar, India. *Oral Health and Dental Management* 2012;11(4):162-8.
13. Crema M, Verbano CJT, management cr. Guidelines for overcoming hospital managerial challenges: a systematic literature review. *Therapeutics and clinical risk management* 2013;9:427.
14. Ranjan R, Pathak R, Singh DK, Jalaluddin M, Kore SA, Kore ARJJoISoP, *et al*. Awareness about biomedical waste management and knowledge of effective recycling of dental materials among dental students. *J Int'l Society of Preventive & Community Dentistry* 2016;6(5):474.
15. Diaz-Soriano A, Gallo W, Luza S, Munive-Degregori A, Bocanegra R, Mayta-Tovalino FJJoISoP, *et al*. Knowledge and awareness of effective recycling of dental materials and waste management among Peruvian undergraduate students of dentistry: A logistic regression analysis. *J Int'l*

Society of Preventive & Community Dentistry 2020;10(3):309.
16. Hashim R, Mahrouq R, Hadi NJJoID, Research M. Evaluation of dental waste management in the Emirate of Ajman, United Arab Emirates. *J International Dental and Medical Research* 2011;4(2):64.
17. Sabbahi DA, El-Naggar HM, Zahran MH. Management of dental waste in dental offices and clinics in Jeddah, Saudi Arabia. *J Air & Waste Management Association* 2020 Oct 2;70(10):1022-9. 18.
18. Tripathi S, Singh RD, Singhal R, Khanna R, Arya D, Parlani SJJoDP, *et al*. Sharps Safety and Management among Dental Practitioners. *J Dental Problems and Solutions* 2017;4(2):015-8.
19. Makul N. Advanced smart concrete-A review of current progress, benefits and challenges. *J Cleaner Production* 2020 Nov 20;274:122899.
20. Chikanma N, Okoronkwo SC, Emaimo J, Ejike EA, Ismaila MD, Rachael O. Dental Waste Management Practices among Dental Professionals, in Selected Dental Hospitals/Clinics and Laboratories, in South East Nigeria. *J Dental and Medical Sciences* 2021,20(3):43-48
21. Cigerim L, Kaplan VJJoOH, Epidemiology O. Evaluation of waste knowledge levels of staff and students working in a school of dentistry, in Van, Turkey, in 2019. *J Oral Health and Oral Epidemiology* 2020;9(3):116-21.