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Assessment of Knowledge, Attitude and Practices Regarding Biomedical Waste Management Among Dental Practitioners of Udaipur City: A Cross-Sectional Study

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A B S T R A C T

Aim: The aim of the present study was to assess the knowledge, attitude and practices regarding biomedical waste management among the private dental practitioners of Udaipur city.

Methods: The Descriptive Study was conducted in Udaipur City on Private dental practitioners for the period of 3 months. 200 dental practitioners were included in the study.

Results: 98% dental clinics had tie up with biomedical waste management companies and 90% practitioners segregate biomedical waste according to the guidelines. 100% had needle destroyer and 96% participants dispose off cotton and gauze contaminated by blood. 75% and 94% participants dispose off pharmaceutical waste and used syringes respectively. 95% and 88% participants dispose off metal sharps and broken glass wares respectively. 40% practitioners don't dispose fixer and developer as they had shifted to RVG for X rays. 72% practitioners dispose off orthodontic bracket wires and 81% used personal protective measures while handling BMW.

Conclusion: Level of Knowledge, Attitude and Practices among dental practitioners of Udaipur city is fair.

INTRODUCTION

In hospitals, the production of BMW is inevitable. The way hospitals are escalating in this COVID pandemic era with a noble intention to meet the social demand has parallelly amplified the generation of BMW.[1] Considering the dental health centers, private or government, which generate comparatively little solid waste related to the other medical fields, nowadays, the

continuously increased producti on of dental solid waste has drawn the attention towards its strict management.[2]
Its serious and direct significant health impact on the civic, our healthcare professionals, and the environment necessitates its management.[3] As stated in the BMW (Handling and Management) Rules 1998 by Indian government, "Biomedical waste (BMW) is defined as the waste produced during diagnostic process, immunization or treatment of animals or humans or in research activities in the testing or production of biologicals." According to a notification of the Government of India (1998), BMWM is a component of hospital sanitation and maintenance task s, including supervision of a variety of activities, including assortment, transportation, operation, or treatment of waste processing systems.[4]

The term "management" refers to the process of making sure BMW is managed properly to prevent adverse health effects as well as environmental damage due to the improper handling of such hazardous wastes.[5] The waste generated in dental setups is basically a subset of hazardous BMW consisting of innumerable materials such as masks, cotton, plastic, glass, latex, needles, sharps, extracted teeth, and other materials, much of which can be contaminated with body fluids and, on mishandling, can cause needle stick injuries or any another unusual diseases.[6,7] According to the World Health Organization, 85% of hospitals' wastes are basically harmless, 10% are infectious, and 5% are not infectious, but are s till considered hazardous wastes. Approximately 15–35% of hospital waste is classified as infectious or hazardous, and this variable data seems to be directly related to the quantity of waste generated.[8]

Improper disposal of needles and sharps can introduce pathogens through a cut which can probably not only instigate bacteremia but can also spread through the bloodstream and can infect various organs. According to the Centers for Disease Control and Prevention, about 5 lakh people are infected in the United States through these blood-borne pathogens each year which are found mostly in medical waste. HIV and hepatitis are the two diseases spread most commonly by microorganisms that spread through the blood, found in medical waste along with other infections like parasitic infections, tuberculosis, pneumonia, influenza, meningitis, and diarrhea.[9]
The aim of the present study was to assess the knowledge, attitude and practices regarding biomedical waste management among the private dental practitioners of Udaipur city.

MATERIALS AND METHODS

The Descriptive Study was conducted in Udaipur City on Private dental practitioners for the period of 3 months. 200 dental practitioners were included in the study.
Inclusion Criteria:

- The participant should be a qualified (minimal BDS qualification) and registered dentist
- The participant should be a dental practitioner in Udaipur city

Exclusion criteria:

- Practitioner who do not want to participate or provide informed consent Methodology

A list of private dental practitioners was prepared referring IDA registration list of Udaipur city and also through snowball sampling, the participants were included in the study.
Ethical clearance was obtained from ethical committee of pacific dental college and hospital. Informed consent from all the participants was obtained. Participants were also informed that participation is voluntary, and confidentiality of data will be maintained. Health education

regarding the biomedical waste management was imparted employing power point presentation. The power point presentation consisted of introduction to biomedical waste, environmental production act, regarding the actions for violating the act, segregation of biomedical waste according to the colour code (2016) given by the central government of India for the biomedical waste management.[10-12]

Questionnaire (Annexure I)
Structured, Self-administered, close ended questionnaire containing:

- Eight knowledge based questions
- Eight attitude based questions
- Eleven Practices based questions

Statistical Analysis

Data collected was entered in an Excel sheet. Each correct and incorrect response and each yes and no questions were given 1 and 0 mark respectively. KAP of each of the participants was measured by corresponding scores in each section of the questionnaire. Data analysis was done with the help of computer using SPSS Statistical Package-Version 22. Using this software, frequencies, percentages, means, standard deviations, and 'p' values were calculated. A 'p' value less than 0.05 was taken to denote significant relationship.

RESULTS

Table 1: Distribution of basic sociodemographic characteristics of the study participants

Gender	**N**	**%**
Male	64	32
Female	136	68
Qualification		
BDS	32	16
MDS	168	84
Years of experience		
0-5 years	96	48
5-10 years	40	20
>10 years	64	32

A total of 200 dental practitioners responded to the questionnaire. 68% participants were females, 84% had post graduate qualification and 32% had work experience of more than ten years.

Table 2: Distribution of participants according to their level of knowledge on Biomedical Waste Management

According to their level of knowledge		
Poor	8	4
Moderate	40	20
Good	64	32
Excellent	88	44

According to their level of knowledge on Biomedical Waste Management, 44% had excellent knowledge followed by 32% good, 20% had moderate and 4% had poor.

Table 3: Knowledge questions and their response

Knowledge questions	**Response N (%)**
1. Do you know about BMW	
Yes	190 (95)
No	10 (5)
2. Do you know it is important to know about biomedical waste generation	
Yes	192 (96)
No	8 (4)
3. Do you know Biomedical waste (management and handling) rules were first proposed in	
Yes	150 (75)
No	50 (25)
4. Do you know about amendments to the biomedical waste (management and handling) rules were made in	
Yes	134 (62)
No	66 (38)

5. Are you aware that biomedical waste management rules are applicable to dentists	
Yes	140 (70)
No	60 (30)
6. Do you think that all the waste generated in the hospitals are hazardous	
Yes	110 (55)
No	90 (45)

7. Do you know according to national guidelines, what is the maximum time limit for which biomedical waste can be stored	
Yes	40 (20)
No	160 (80)
8. Do you know about the universally accepted symbol for biohazard	
Yes	164 (82)
No	36 (18)

According to the knowledge of participants, 95% knew about the BMW and 4% didn‘t know about the importance of biomedical waste. 75% participants didn‘t know about proposed years of biomedical waste management and handling and 62% knew about the amendments of biomedical waste. 70% dental practitioners knew about the biomedical waste rules are applicable to the dentists as well and 55% participants knew about the hazardous effect of hospital waste. 20% knew about the storage of biomedical waste and 82% knew about the universally accepted symbol for biohazard.

Table 4: Attitude questions and their response

Attitude questions	**Response N (%)**
1. Do you think safe management of health care waste is important	
Yes	194 (97)
No	6 (3)

2. Do you agree that biomedical wastes should be segregated into different categories	
Yes	190 (95)
No	10 (5)
3. Do you feel that BMW should compulsory be made part of dental under graduate curriculum	
Yes	186 (93)
No	14 (7)
4. Do you think your knowledge regarding BMW is adequate	
Yes	180 (90)
No	20 (10)
5. Do you think you require any further training on BMW	
Yes	184 (92)
No	16 (8)
6. Do you think waste management is also Doctor‘s responsibility	
Yes	160 (80)
No	40 (20)
7. Safe management efforts by the hospital increase the financial burden on management	
Yes	184 (92)
No	16 (8)
8. Do you know it is important to report to pollution control board of India about particular institution if it is not complying with the guidelines for BMW	
Yes	156 (78)

No	44 (22)

97% participants understand about safe management of biomedical waste and 5% didn't know about the segregation of biomedical waste into different categories. 93% practitioners suggested that biomedical waste should be made compulsory in under graduate curriculum and 90% agreed to the fact that knowledge regarding BMW is insufficient. 92% showed interest in further training of BMW and 20% considered that BMW is not Doctor's responsibility. 92% said that safe management of BMW put extra burden on the hospital and 22% disagreed to the fact that they are not bothered by the other institutions if they are following the guidelines of BMW or not.

Table 5: Practice questions and their response

Practice questions	**Response**
1. Does your clinic have a tie up with waste management companies	
Yes	196 (98)
No	4 (2)
2. Do you needle destroyer for discarding the used needles	
Yes	200 (100)
No	0
3. Do you segregate the biomedical waste according to different categories	
Yes	180 (90)
No	20 (10)
4. Do you dispose cotton, gauze and other items contaminated by blood	
Yes	192 (96)
No	8 (4)
5. Do you dispose pharmaceutical waste	
Yes	150 (75)
No	50 (25)
6. Do you dispose used syringe	
Yes	188 (94)

No	12 (6)
7. Do you dispose metal sharps	
Yes	190 (95)
No	10 (5)
8. Do you dispose broken glass wares	
Yes	176 (88)
No	24 (12)
9. Do you dispose the used fixer and developer solution	
Yes	120 (60)
No	80 (40)
10. Do you dispose the orthodontic brackets and wires	
Yes	144 (72)
No	56 (28)
11. Are you using personal protective measures while handling BMW	
Yes	182 (81)
No	18 (9)

98% dental clinics had tie up with biomedical waste management companies and 90% practitioners segregate biomedical waste according to the guidelines. 100% had needle destroyer and 96% participants dispose off cotton and gauze contaminated by blood. 75% and 94% participants dispose off pharmaceutical waste and used syringes respectively. 95% and 88% participants dispose off metal sharps and broken glass wares respectively. 40% practitioners don‘t dispose fixer and developer as they had shifted to RVG for X rays. 72% practitioners dispose off orthodontic bracket wires and 81% used personal protective measures while handling BMW.

DISCUSSION

Health care activities like medical treatments, diagnostic tests, immunization, and laboratory examinations restore health and save lives. At the same time, health services may generate large quantities of wastes and by-products that need to be handled safely and disposed of properly.[13] This may cause many ill effects to those who come in contact with the waste.[14]

Health care setting is a major contributor of biomedical wastes. In India, about 0.33 million tons of hospital waste is generated annually.[15] BMW management is an integral part of infection control program and if mismanaged, medical wastes can contaminate the entire environment of the hospital.[16]

A total of 200 dental practitioners responded to the questionnaire. 68% participants were females, 84% had post graduate qualification and 32% had work experience of more than ten years. According to their level of knowledge on Biomedical Waste Management, 44% had excellent knowledge followed by 32% good, 20% had moderate and 4% had poor. People who are exposed and handle BMW are at higher risk of health hazards. They include health-care employees, dentists, patients, waste handling, and treatment workers. The Biomedical Waste (Management and Handling) Rules state that it is the duty of every occupier of an institution generating biomedical waste to take all steps to ensure that such waste is handled without any adverse effect to human health and the environment.[17] The central government made certain rules to amend the BMW Management Rules, 2016, published in the gazette of India which was called as BMW Management (amendment) Rules, 2018.[18] Guidelines and protocols for BMW management should sternly be followed at each level of generation, collection, transportation, storage, treatment, and disposal.[19] For this, it is essential to be aware of the steps in waste management which includes mainly survey of wastes, waste segregation, waste accumulation, storage and transport, waste pre-treatment, and waste disposal by appropriate methods.[20]

According to the knowledge of participants, 95% knew about the BMW and 4% didn‘t know about the importance of biomedical waste. 75% participants didn‘t know about proposed years of biomedical waste management and handling and 62% knew about the amendments of biomedical waste. 70% dental practitioners knew about the biomedical waste rules are applicable to the dentists as well. In general, only 10–25% of health-care waste is hazardous but the current study reveals that 55% of students opined that all health-care wastes were hazardous. A study done in North India by Kumar et al[21] also reported close to 60% of respondents considering all health-care wastes as hazardous. Regarding the time limit for storage of BMW, it was observed that only 20% of participants were aware that as per national guidelines, BMW cannot be stored for more than 24 h. This is in contrast to a study done by Kulkarni et al.[22] 97% participants understand about safe management of biomedical waste. About 95% of the respondents agreed that biomedical waste should be segregated into different categories. The observations were consistent with most studies discussed earlier.[23-25]

75% of respondents improperly disposal of pharmaceutical waste which was also close to results reported by Singh RD et al[25] where 77.5% disposed such waste into common bins. In a training institution, students rarely are associated with disposing discarded medicines; however, lack of knowledge of the proper disposal of pharmaceutical waste is a concern that needs to be addressed. In dental settings, proper disposal of waste sharps such as infected needles is particularly essential to avoid needle stick injuries and acquiring infections such as hepatitis and HIV. Correct disposal of such waste into puncture proof containers was practiced by 56% of respondents in this study, showing that still about a half of them do not do so. This observation calls for an introspection regarding the disposal of sharps. There was a statistically significant difference between the groups with undergraduate students performing poor compared to house surgeons and postgraduate residents. In a study by Lakshmikantha R et al[26] even lesser, that is, 20.6% practiced the same. 72% practitioners dispose off orthodontic bracket wires and 81% used personal protective measures while handling BMW. There is a high possibility of inadvertent needle pricks for waste handlers if disposed in red or yellow waste bags.

CONCLUSION

The present study concluded that for successful implementation of BMW management program one of the prerequisite is cooperation and willingness of health care professionals. Safe disposal of BMW will also ensure protection of community and environment. Continuing training programs which emphasize on BMW management practices would assist in improving the present situation of safe handling and disposal of health care waste. The awareness of such regulations among the public and health workers, along with development of policies and enforcement that respect those laws, is required. Proper measures must be taken to minimize hazardous waste production or action should be made to make certain that all BMW is disposed of in agreement with environmental legislation. Educational institutions, therefore, must focus on imparting training for BMW management through visits to treatment facilities and also ensure that students follow rules on appropriate waste management strictly beginning from their clinical years itself.

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