

Assessment of Knowledge, Attitude, and Practices regarding Awareness of Biomedical Waste Management among Health Care Personnel: A Cross-sectional Survey

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ABSTRACT

Introduction: Waste generated due to health care practice is a subset of hazardous biomedical waste (BMW). Health care practices generate large amounts of cotton, plastic, latex, glass, sharps, extracted teeth, and other materials, which may be contaminated with body fluids.

Objectives: The objectives are to assess knowledge, attitude, and practices of health care personnel regarding BMW management and to determine awareness regarding needle-stick injury among different categories of health care professionals.

Materials and methods: The present cross-sectional study includes health care personnel in A.C.P.M. Dental College, Dhule, Maharashtra, India. A structured, self-administered questionnaire consisting of 15 closed-ended questions was employed to 100 staff (nurses, lab technicians, and class IV employees). Among all, 80 responded and willingly participated in the survey and filled the questionnaire.

Results: The results of the present study showed that there is remarkable difference between the knowledge, attitude, and practices of nurses, laboratory technicians, and class IV employees regarding BMW management. Also, there is lack of awareness regarding needle-stick injuries.

Conclusion: Present study showed lack of knowledge and awareness toward BMW management. As a consequence, there is an inappropriate practice of BMW handling and management, thus exposing themselves and the general public to health and environment hazards.

Keywords: Biomedical waste management, Class IV employees, Health care personnel, Laboratory technicians, Nurses.

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INTRODUCTION

Biomedical waste (BMW) means any solid and/or liquid waste including its container and any intermediate product, which is generated during the diagnosis, treatment, or immunization of human beings or animals or in research pertaining thereto or in the production or testing of biologics, including categories mentioned in Schedule I of BMW Rules of 1998.¹⁻³ Due to increased awareness regarding human immunodeficiency virus/acquired immunodeficiency syndrome, hepatitis B and hepatitis C, and other potential infectious diseases, BMW management is now considered as a prime concern. 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.² This may cause many ill effects to those who come in contact with the waste.⁴

Hazardous waste management is of great concern now for every health care organization. It is estimated that 10 to 25% of health care waste is hazardous, with the potential for creating a variety of health problems.^{3,5} Since the implementation of the biomedical Waste Management Rules 1998, every concerned health personnel should have the proper knowledge, practice, and capacity to guide others in waste collection, its management, and proper handling techniques.⁵ This may help in prevention of many communicable diseases and save many lives.

All individuals exposed to BMW like medical staff members, patients, visitors, sanitary staff or general public are at a great risk of being injured or infected, if BMW is not managed or handled properly. It may cause environmental degradation also, if not handled carefully. A proper knowledge, clear understanding, awareness of

roles and responsibilities of health care workers regarding handling of BMW can go a long way toward the safe disposal of hazardous hospital waste and protect the general public from various diseases or other ill effects.¹

In our country, as per the Biomedical rules, approximately 90 to 100 kg of BMW is generated every day in the hospital establishment. So, it should be the duty of the hospital staff to look into the safe handling and proper management of waste.³ Efforts of health care personnel may seem small, but each step taken by them can build a base of sound behavior and thinking, which are necessary for the success of whole scenario.^{4,6} They also have an important role in maintaining the environment and protecting it. So, in the present study, an attempt was made to assess the knowledge, attitude, and practices among health care personnel toward waste generated.

MATERIALS AND METHODS

The present cross-sectional study was conducted at A.C.P.M. Dental College, Dhule, Maharashtra, India. The purpose of the present study was explained to all the participants and written informed consent was taken from them. Enough time was given to all the participants to fill up the questionnaire.

Duration

The present study was conducted over a period of 5 days.

Target Population

The study was targeted at health care personnel which included nurses, laboratory technicians, and class IV employees.

Obtaining Ethical Clearance

Ethical clearance for the survey was obtained from the institutional ethical review committee.

Preparation of Questionnaire

After the approval from the ethical review committee, a structured and self-administered questionnaire consisting of 15 closed-ended questions was prepared and tested by a pilot study on 15 subjects (Cronbach's alpha 0.774). The required changes were made and the questionnaire was finalized later. The questionnaire was distributed in the form of hard copy to 100 of the above-mentioned health care personnel; of them, 80 health care workers (30 nurses, 20 laboratory technicians, and 30 class IV employees working in A.C.P.M. Dental College, Dhule, Maharashtra, India) responded (response rate was 80%). All the participants were strictly not allowed to confer with each other during the present survey. The questionnaire consisted of

demographic data and information regarding knowledge and hazards of BMW, segregation practices, color coding, needle cutter, vaccination status, and preventive safety measures of health care workers. The descriptive data obtained were properly tabulated.

Statistical Analysis

Descriptive and inferential statistical analyses were carried out in the present study using software IBM's Statistical Package for the Social Sciences version 17.0 (IBM Corporation, Armonk, New York, USA). Results on categorical measurements were presented in number (%) and Chi-square test was used. Level of significance was fixed at $p = 0.05$, and any value ≤ 0.05 was considered to be statistically significant.

Inclusion Criteria

- Subjects willing to participate in the present study.
- Subjects who were present at the institute when the present study was conducted.
- Subjects who completely filled the questionnaire.

Exclusion Criteria

- Subjects who were not willing to participate in the present study.
- Subjects who were absent or on leave for any reason when the present study was conducted.
- Subjects who did not fill the complete questionnaire.
- Subjects who participated in pilot survey.

RESULTS

Demographic data of the present study showed most of the health care personnel were between the ages 31 and 40 years (33–41.25%); nurses (30–37.5%) and class IV employees (30–37.5%) were the majority of the participants. Among the 80 participants, 60% were females and 40% were males (Table 1).

There was a statistically significant difference when all participants were asked about their experience of needle-stick injury during the last 12 months (Table 2).

Table 1: Demographic data

		N (%)
Age group (years)	<30	16 (20%)
	31–40	33 (41.25)
	41–50	21 (26.25)
	>50	10 (12.5)
Health care personnel	Nurses	30 (37.5)
	Lab technicians	20 (25)
	Class IV employees	30 (37.5)
Total (80)	Males	32 (40%)
	Females	48 (60%)

Table 2: Knowledge and awareness regarding BMW management and needle-stick injury among health care personnel (Chi-square test)

Questions	Nurses (n = 30)	Technician (n = 20)	Class IV (n = 30)	p-value	
Knowledge	Do you know about BMW generation?	18 (60%)	9 (45%)	15 (50%)	0.852
	Do you think it is important to know about BMW generation, hazards, and legislation?	25 (83.3%)	23 (80%)	16 (76.6%)	0.812
	BMW rules were first proposed in?	14 (46.7%)	8 (40%)	9 (30%)	0.892
	Do you need a separate permit to transport BMW?	5 (16.7%)	2 (10%)	3 (10%)	0.893
	According to the BMW rules, waste should not be stored beyond?	7 (23.3%)	6 (30%)	9 (30%)	0.976
Awareness	Is the waste disposal practice correct in your hospital?	30 (100%)	20 (100%)	30 (100%)	–
	Do you know about color-coding segregation of BMW?	14 (46.7%)	8 (40%)	17 (56.7%)	0.832
	Do you follow color-coding for BM waste?	14 (46.7%)	8 (40%)	17 (56.7%)	0.832
	Do you know waste management is a team work?	9 (30%)	4 (20%)	5 (16.7%)	0.661
	What is the approximate proportion of infectious waste among total waste generated from a health care facility?	4 (13.3%)	1 (5%)	1 (3.3%)	0.739
Needle-stick injury	Are you aware of consequences of needle-stick injury?	30 (100%)	20 (100%)	30 (100%)	–
	Do you discard the used needle immediately?	18 (60%)	13 (65%)	19 (63.3%)	0.931
	Is needle-stick injury a concern?	22 (73.3%)	13 (65%)	19 (63.3%)	0.932
	Do you recap the used needle?	4 (13.3%)	2 (10%)	3 (10%)	0.901
	Have you experienced a needle-stick injury during the last 12 months?	6 (20%)	16 (80%)	25 (83.3%)	0.001

Table 3: Level of knowledge among health care personnel about BMW generation, hazards, and legislation (Chi-square test)

Health care personnel	Scoring criteria			p-value
	Excellent	Good to average	Poor	
Nurses	4 (13%)	14 (47%)	12 (40%)	(Nurses vs technicians) 0.017
Lab technicians	2 (10%)	7 (35%)	11 (55%)	(Nurses vs class IV) 0.001
Class IV employees	2 (7%)	13 (43%)	15 (50%)	(Technicians vs class IV) 0.001

Excellent: 4 or more answers correct; Good to average: 2 to 3 answers correct; Poor: Less than 2 answers correct

Table 4: Awareness regarding BMW management practices among health care personnel (Chi-square test)

Health care personnel	Scoring criteria			p-value
	Excellent	Good to average	Poor	
Nurses	5 (17%)	13 (43%)	12 (40%)	(Nurses vs technicians) 0.067
Lab technicians	1 (5%)	10 (50%)	9 (45%)	(Nurses vs class IV) 0.001*
Class IV employees	3 (10%)	16 (53%)	11 (37%)	(Technicians vs class IV) 0.077

Excellent: 4 or more answers correct; Good to average: 2 to 3 answers correct; Poor: Less than 2 answers correct; *Statistically significant value p<0.05

Table 5: Knowledge regarding needle-stick injuries among health care personnel (Chi-square test)

Health care personnel	Scoring criteria			p-value
	Excellent	Good to average	Poor	
Nurses	4 (13%)	18 (60%)	8 (27%)	(Nurses vs technician) 0.008*
Lab technicians	2 (10%)	11 (55%)	7 (35%)	(Nurses vs class IV) 0.001*
Class IV employees	3 (10%)	16 (53%)	11 (37%)	(Technicians vs class IV) 0.006*

Excellent: 4 or more answers correct; Good to average: 2 to 3 answers correct; Poor: Less than 2 answers correct; *Statistically significant value P<0.05

When level of knowledge was assessed among all health care personnel who participated in the present study, there was statistically significant difference observed (Table 3).

While comparing awareness regarding BMW management among lab technicians, there was a statistically significant difference. They had average knowledge (Table 4).

On comparison of knowledge among health care personnel regarding needle-stick injuries, there was statistically significant difference among nurses, lab technicians, and class IV employees (Table 5).

DISCUSSION

Health care personnel are the key workers in the management of BMW generated by health care practices. The

inadequate knowledge of this crucial workforce is dangerous for society and themselves too.³ The present study assessed the knowledge regarding BMW management and level of awareness and knowledge regarding needle-stick injuries through a closed-ended questionnaire. Such questions are easy to analyze and may achieve a quicker response from participants.⁷

The results of present study showed that knowledge regarding BMW management was poor among health care personnel. Very few had excellent knowledge ($p < 0.05$). This is in accordance with the study conducted by Narang et al,⁸ who showed a lack of knowledge among auxiliary staff in dental clinics/hospitals. Goyal et al⁹ also showed that there was lack of knowledge among medical, paramedical, and dental practitioners regarding BMW. Das and Biswas¹⁰ showed that there is lack of knowledge regarding BMW among health care providers and there is a need to conduct programs to increase the awareness regarding the same. Chaudhari et al¹¹ showed variable and inconsistent knowledge among undergraduate and postgraduate practitioners regarding BMW. This is in contrast to the study conducted by Singh et al¹² who showed medical, dental, paramedical staff, and graduate and postgraduate students of a medical and dental university of Lucknow, India, had good theoretical knowledge and practice too and training programs are recommended for the same also. Sood and Sood¹³ showed many dentists had knowledge about waste management, but they lacked an appropriate attitude to practice it.

Present study showed lack of awareness regarding BMW practices among health care personnel, especially lab technicians ($p < 0.05$). Most of the health care personnel had good to average knowledge. This is in accordance with the recently conducted research by Sharma et al¹⁴ who showed the need to improve awareness level among health care workers. A systematic review of all the cross-sectional studies conducted by Kapoor et al¹⁵ showed inadequate knowledge and awareness levels regarding BMW, and there is a great need to conduct continuing education and training programs. Pullishery et al¹⁶ showed that doctors, nurses, and laboratory technicians had better knowledge than sanitary staff. Proper and judicious handling of BMW continues to be a matter of serious concern for health authorities in India.

Needle-stick injuries are also of great concern, which may be the cause of the spread of many infectious diseases. Present study showed inadequate knowledge regarding needle-stick injuries among health care personnel ($p < 0.05$). This is in accordance with the study conducted by Sharma et al.⁷ A study of medical waste management in the south of Brazil revealed that all the health care facilities promoted segregation of sharp waste.¹⁷

Thus, it is seen that for proper disposal of BMW, there is a great need to introduce laws regarding BMW management. The awareness of these laws among the public, as well as development of policies and its enforcement is essential. Appropriate measures should be taken to minimize hazardous waste where possible or action should be taken to ensure that all generated waste is disposed of in a safe manner to protect the environment as well as human health.

CONCLUSION

The present study showed that there is lack of knowledge and awareness among health care personnel regarding BMW management and needle-stick injuries.

PUBLIC HEALTH SIGNIFICANCE

Present study is of public health significance. Knowledge and awareness regarding BMW management or needle-stick injuries can save many lives by avoiding spread of infections or communicable and unavoidable diseases not only to public, but to practitioners also. Not only health care workers, but the public also should be aware of safe waste disposal because it is a team work and cannot be handled by a single person.

LIMITATIONS AND RECOMMENDATIONS

Present study has its own limitations. It is limited to a small number of participants and a single institute. Authors would like to recommend such kind of studies on a large population and compare it with other institutes too. Also, there is a need to conduct training programs to spread the knowledge regarding the same, and evaluations of such programs are also necessary through research on the same.

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