

## Original Article

# Creating awareness on biomedical waste management among medical undergraduates: An investment into future

<sup>1</sup>Dr Ekadashi Rajni , <sup>2</sup>Suneel Bhooshan, <sup>3</sup>Dr Rajani Sharma , <sup>4</sup>Dr P K Khatri

<sup>1</sup>MD Microbiology, Assistant Professor, Rajasthan University of Health Sciences, Jaipur - 302033

<sup>2</sup>Senior Demonstrator , Dr SNMC Jodhpur Rajasthan, 342002

<sup>3</sup>MD Microbiology, Assistant Professor, American International Institute of Medical Sciences, Udaipur – 313001

<sup>4</sup>Prof & Head, Microbiology, Dr SNMC Jodhpur Rajasthan, 342002

Corresponding Author: Dr. Rajani Sharma

### Abstract

**Aims & Objective:** This study was conducted to determine the knowledge, attitude and practices regarding BMW management among medical undergraduates. It was descriptive, questionnaire based cross sectional study.

**Methods:** 180 students were evaluated for BMW knowledge. The study was conducted in two parts first pre training session and post training session.

**Results:** Significant improvement was observed in post training session answers supporting the aim of the study and training sessions were welcomed in future.

**Conclusions:** Such trainings should also be made a compulsory feature in all courses which have any associations to healthcare settings. All health care workers should be trained for BMW before their postings in hospitals or the site of BMW origination to improve their knowledge regarding BMW.

**Key-words:** Awareness Bio medical waste management, Medical undergraduates.

### Introduction:

"Bio-medical waste is referred to as any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biologicals or in health camps."<sup>[1]</sup> According to the WHO fact sheet, February 2018, "Of the total amount of waste generated by health-care activities, about 85% is general, non-hazardous waste comparable to domestic waste. The remaining 15% is considered hazardous material that may be infectious, chemical or radioactive". This fact necessitates good training about segregation practices.

Reports indicate that in India approximately 0.5 to 2.0 kg of BMW per bed is generated in a day. This cumulates to about 0.33 million tons of hospital waste annually.<sup>[2]</sup> To handle such a vast burden the Ministry of Environment and Forestry had laid down guidelines and regulations for management and handling of biomedical wastes (BMW) in Schedule I of BMW Rules of 1998. These were subsequently amended in 2011 and in 2016.

It is important for health care personnel to not only protect themselves but also to protect society from infectious agents like Hepatitis B, HIV, and HCV etc. There have been many reports of transmission of these infectious agents through healthcare waste. According to reports, in 2010, unsafe injections were still responsible for as many as

33800 new HIV infections, 1.7 million hepatitis B infections and 315000 hepatitis C infections.<sup>[3]</sup> A person who experiences one needle stick injury from a needle used on an infected source patient has risks of 30%, 1.8%, and 0.3% respectively of becoming infected with HBV, HCV and HIV. Lack of adequate knowledge or ignorance of proper practices of BMW rules puts all individuals and society on risk and thus serious consequences as well.

The success of any programme is determined by understanding and compliance of the end user. The basic dictum of BMW management guidelines is that generator of waste is responsible for its appropriate management too. The students of medical school today are residents and consultants in the making. If we are able to instil the right protocols and etiquettes in students today, needless to say we will have a more responsible and aware community of doctors tomorrow. Another long term benefit of this arrangement is that good waste practices will percolate down to the nursing and cleaning staff as well. This waste will cease to be a source of infection and injury to the exposed person. Also there will be no deleterious effect on the environment.

There is no dearth of studies on measuring the awareness level of BMW and its management. Information on many are available on internet portals and have been carried out among health care workers, residents, laboratory technicians and nurses.<sup>[4, 5, 6]</sup> But a very few have assessed the knowledge in medical undergraduates. Considering their important role in the medical hierarchy and also understanding their vast potential in bringing out any substantial change, the current study was planned. This is all the more important because the current undergraduate books still have not included the new guidelines as put forth in 2016.

#### **Material and Methods:**

A descriptive, questionnaire based cross sectional study was conducted in a Medical College, Jodhpur in February 2018. Jodhpur is the second largest city in the Indian state of Rajasthan and officially the second metropolitan city of the state. This Medical College is situated in the city and has five affiliated hospitals. Students are admitted through a common entrance test and are present from largely the central and western part of India. This study was conducted to determine the knowledge, attitude and practices regarding BMW management. A total of 180 students participated.

A pre-designed, pre-tested, structured proforma consisting of 30 questions in English language was used for data collection from all the study participants after getting their informed consent and confidentiality was assured. Study proforma contained 6 sets of questions concerning the knowledge, attitude and practice on the subject. All sections carried 5 marks and final score was calculated accordingly. Results were categorized as excellent (25-30), good (20-25) and poor knowledge (less than 20 marks).

#### **Results:**

180 medical students participated out of a total class strength of 250. Out of these 120 were male and 60 female students. Response was calculated in 100 percent (not attempted question were analysed as wrong answered). The participant's ages were 18-25 years (mean age 19 year 6 months). None of them had previous training or class on BMW.

**Awareness of hazards of BMW and transmission and precaution**

**Pre- and Post-Training Scores of Study Participants**

Only 5% of candidates had basic knowledge (definition, existing guidelines) about BMW which falls under poor category according to grading criteria but 16% had awareness of how and where BMW is generated. Respondents had practically no knowledge about segregation of biomedical waste, storage, transportation, treatment and disposal methods (only 3% were aware). Knowledge of the impact on society was also not good in our study population.

Only a few respondents could respond to this question in a scientific way. Respondents had the least awareness regarding administrative aspects of biomedical waste management.

**Table 1 Demographic data**

Characteristics	Number n = 180 (percentage)
Age	18-25 years; mean age (19 year 6 months)
Sex	
Male	120 (66.70%)
Female	60 (35.30%)
Received any training for BMW management	
Yes	00 (00.00%)
No	180 (100%)

**Table 2: Pre and post training score analysis**

Assesment Category	Score	Pre Training Score Mean±S.D.	Post Training Score Mean±S.D.
Part I. Basic knowledge of BMW	Poor	1.36±0.80	4.91±0.28
Part II. Place and person responsible for BMW origin	Good	3.92±0.88	4.79±0.42
Part III. Awareness of BMW Segregation guidelines	Poor	2.19±1.11	4.95±0.22
Part IV. Impact of BMW on individual and society	Poor	1.43±1.04	4.64±0.55
Part V. Management of BMW	Poor	2.1±0.84	4.82±0.39
Part VI. Attitude towards practice and implementation of these rules	Excellent	4.96±0.21	4.99±0.07

**Table 3 percentage of correct response in pre and post training sessions**

<b>Part I. Basics knowledge of BMW</b>	Pre-training response		Post-training response	
	Number	Percentage		
What is BMW?	110	61.10%	180	100%
Impact of BMW on society?	90	50.00%	177	98.33%
Governing body to regulate BMW?	20	11.10%	167	92.77%
Awareness about existing guidelines?	25	13.89%	180	100%
Any training or session attended in past before this event?	00	00.00%	180	100%
<b>Part II. Place and person responsible for BMW origin</b>				
Recognize the symbol of BMW?	140	77.78%	174	96.67%
Is our hospital generating BMW	145	80.55%	170	95.55%
All the site that generate BMW?	129	71.66%	169	93.88%
Is there any guidelines being followed at present hospital for BMW that you are aware of?	153	85.00%	170	95.55%
Is only medical staff responsible for generation of Biomedical waste?	139	77.22%	177	98.33%
<b>Part III. Awareness of BMW Segregation guidelines</b>				
Is it necessary to segregate BMW?	103	57.22%	178	98.88%
Use of segregation?	76	42.22%	176	97.78%
Segregation is responsibility of?	47	26.11%	179	99.44%
Segregation system is based on colour coding?	98	54.44%	180	100%
What happens to BMW after segregation?	71	39.44%	178	98.90%
<b>Part IV. Impact of BMW on individual and society</b>				
Is BMW always infectious?	62	34.44%	171	95%
Proportion of Hazardous Waste Amongst total Hospital Waste Generated?	11	06.11%	151	83.83%
Diseases Spread from BMW?	86	47.78%	155	86.11%
Persons at Risk of Exposure?	43	23.89%	176	97.78%
Vaccinated medical staff is always safe even after exposure to infectious BMW?	55	30.56%	180	100%
<b>Part V. Management of BMW</b>				
Is hospital administration involved in implication of BMW guidelines?	113	62.78%	175	97.22%

How often BMW should be segregated and disposed?	38	21.11%	170	94.44%
Are all BMW categories disposed in same way?	130	72.22%	180	100%
Are expired medicines included in BMW?	52	28.89%	168	93.33%
All BMW is treated with chemicals and incinerated in hospital?	45	25.00%	174	96.67%

**Table 4 Attitude towards practice and implementation of these rules**

PARAMETER	NO. OF RESPONSES
In your opinion BMW rules should be practised?	180
Coding system is helpful for segregation?	179
Should these guidelines be strictly implemented on corporate hospitals?	180
Do you find this training helpful?	180
How frequent these session should be taken?	Very frequent (every three months)

#### **Discussion:**

Strict adherence to the BMW management norms require a team effort from healthcare workers like doctors, nursing staff, medical students as well as attendants. This is not only a legal necessity but also a social responsibility, where healthcare workers play a key role in protecting society and environment. Any policy is only as good as much as it is followed. Merely being in the papers without execution is almost a waste. Medical undergraduates are a vital part of the entire machinery operating in the hospital. Their sound training in this field can have exponential far reaching results. Not only will they become more responsible practitioners, but will also keep a check on the compliance to the norms by nursing as well as cleaning staff. Through students ending up in the private set up, the message will reach the community as a whole ensuring better understanding. The current study was formulated with a dual purpose. First was to access the baseline knowledge of medical students about BMW management using a structured questionnaire. And more importantly to educate them about the current revised guidelines, thus ensuring better compliance. In addition to the didactic lectures, more interactive and thought provoking methods were followed. These included role plays, practical demonstrations, organizing quiz, use of social forums, poster making competitions etc. Attitude of students towards these sessions was very positive and the response was overwhelming. Just like the study conducted by Acharya R et al<sup>[7]</sup> where 88 % of the selected students (clinical, para-clinical and nursing) did not have any training, our study population was also naïve. The current editions of undergraduate books on microbiology also do not cover the newer guidelines. Lack of trainings on BMW management have been reported from all over the world.<sup>[8, 9, 10]</sup>

In pre-training analysis, overall score in all sections was poor. The baseline knowledge about BMW among students was poor as evident from all sections in one table number 3. Similar findings have been suggested by Shafee M

(2010)<sup>[11]</sup>. Only 1.6% study subjects knew about bio medical waste. However, the study conducted by Acharya R and Bathma V<sup>[7, 12]</sup> had showed very luminous figures with up to 90% of studied population quite aware. The reason of poor scoring in pre training session was the result of absent or very low exposure of the topic to the study respondents.

Regarding the key factors in BMWM, only very few students were aware of the site of waste generation and segregation step. The question to which most encouraging response was elicited was the potential impact on the society where the answers fall under good category (according to our grading system, scoring 22 points). In other sections the scores ranged heterogeneously starting from 8 to 20 points with the highest standard deviation value being  $\pm 1.11$ . After training and various interactive sessions, the scores of all sections jumped exponentially reaching up to 29 points and with a sharp reduction in standard deviation (being only  $\pm 0.55$ ). Statistically significant improvement ( $p$  value  $< 0.05$ ) in pre-test and post-test. The study population did not have any idea about the storage of BMW. This was in concordance to results put forth by Malini et al and Anand P.<sup>[13, 14]</sup> However, majority of the students identified biomedical hazard symbol correctly which was consistent with the findings of Madhukumar et al and Basu et al<sup>[15, 16]</sup>. The pre and the post training results in our study further reiterate that training sessions can remarkably improve the knowledge of BMW and hence should be conducted at frequent intervals.

#### **Conclusion:**

“If you are planning for one year, cultivate flowers, If you are planning for one lifetime cultivate trees, And if you are planning for eternity cultivate people.”

In a country like India with wide, complex and diverse healthcare settings, it is difficult to keep track all the time on important and critical topics like biomedical waste management. A fool proof strategy will be to nurture young medical minds with sound waste management policies. This is especially important because the undergraduate curriculum in its present form does not give due weightage to the said topic. The need is to replace didactic lectures with more interesting presentations and active interactions on a regular basis. Such trainings should also be made a compulsory feature in all courses which have any associations to healthcare settings.

#### **References:**

1. Govt. of India, Ministry of Environment and Forests Gazette Notification No 460 dated July 27, New Delhi: 1998: 10-20.
2. Patil AD, Shekdar AV. Health-care waste management in India. *J Environ Manage* 2001; 63: 211-220.
3. Pepin J, Abou Chakra CN, Pepin E, Nault V, Valiquette L. Evolution of the global burden of viral infections from unsafe medical injections, 2000-2010. *PLoSOne* 2014; 9: e99677.
4. Bhagawati G, Nandwani S, Singhal S. Awareness and practices regarding bio-medical waste management among health care workers in a tertiary care hospital in Delhi. *Indian J Med Microbiol* 2015; 33: 580-582.
5. Mathur V, Dwivedi S, Hassan MA, Misra RP. Knowledge, attitude, and practices about biomedical waste management among healthcare personnel: a cross-sectional study. *Indian J Community Med* 2011; 36: 143-145.

6. Rao PH. Hospital waste management system-a case study of a south Indian city. *Waste Manag Res* 2009; 27: 313-321.
7. Acharya R, Sharma G, Sethia R, Meena R. A cross sectional study amongst paramedical workers and nursing students regarding awareness of various aspects of biomedical waste (management and handling) rules. *Int J Community Med Public Health*. 2016; 3: 303-308.
8. Habibullah S, Salahuddin A. Waste Disposal of Government Health-Care Facilities in Urban Area of Karachi: A KAP Survey. *Pak J Med Res*. 2007; 46: 1-4.
9. Ramokate T, Basu D. Health care waste management at an academic hospital: knowledge and practices of doctors and nurses. *S Afr Med J*. 2009; 99: 444-445.
10. Umar A, Yaro A. Hospital Waste Management in Katsina State. *Bayero Journal of Pure and Applied Sciences*. 2009; 2: 22-26.
11. Shafee M, Kasturwar NB, Nirupama N. Study of Knowledge, Attitude and Practices regarding Biomedical Waste among Paramedical Workers in Karimnagar, Andhra Pradesh. *Indian J Community Med*. 2010; 35: 369-370.
12. Bathma V, Likhar S, Mishra M, Athavale AV, Agarwal S, Shukla US. Knowledge assessment of hospital staff regarding biomedical waste management in a tertiary care hospital, Bhopal. *Nat J of Comm Med*. 2012; 3: 197-200.
13. Malini A, Eshwar B. Knowledge, attitude and practice of biomedical waste management among health care personnel in a tertiary care hospital in Puducherry. *Intern J Biomed Res*. 2015; 6: 172 - 176.
14. Anand P, Jain R, Dhyani A. Knowledge, attitude and practice of biomedical waste management among health care personnel in a teaching institution in Haryana, India. *Int J Res Med Sci*. 2016; 4: 4246-4250
15. Madhukumar S, Ramesh G. Study about awareness and practices about health care waste management among hospital staff in a medical college hospital, Bangalore. *Intern J Basic Med Sci*. 2012; 3: 7-11.
16. Basu M, Das P, Pal R. Assessment of future physicians on biomedical waste management in a tertiary care hospital of West Bengal. *J Nat Sci Biol Med*. 2012; 3: 38-42.