



AWARENESS OF THE MEDICAL STUDENTS ON THE UPDATED BIOMEDICAL WASTE MANAGEMENT GUIDELINES IN A TEACHING HOSPITAL AND INITIATION OF CORRECTIVE MEASURES

Microbiology

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ABSTRACT

Introduction: Biomedical waste refers to any type of waste that is generated in healthcare facilities, research and clinical laboratories. The waste that is generated in healthcare facilities carries potentially infectious agents. Therefore it is essential to safely segregate and dispose infectious waste generated in hospitals. The Government of India made Bio medical Waste Management and Handling rules in July 1998. These biomedical waste management rules were amended in 2011 and then in March 2016. Every health care professional is expected gain complete knowledge and to practice according to the waste disposal guidelines. The biomedical waste management guideline mandates every health care facility should segregate, disinfect and dispose its biomedical waste in an eco-friendly manner. Successful waste management program depends on segregation of waste at source and treatment of each category of waste in a suitable manner.

Aim And Objectives: To assess the awareness, knowledge and attitude of Biomedical waste disposal guidelines among medical students. This questionnaire based study was conducted among undergraduate and postgraduate medical students in a tertiary care hospital to assess & evaluate the knowledge and awareness regarding biomedical waste management.

Methodology: Study Design: Prospective cross-sectional questionnaire based study. The study was done using predesigned, semi- structured questionnaire. The study was conducted for undergraduate and postgraduate students in a tertiary care hospital, South India over a period of 1 month.

Results: 45% of the students gave the correct definition of biomedical waste and 89.5% of the students correctly identified the regulating agency for Biomedical waste management in India. 52.6% did not undergo any prior training on biomedical waste management. 77.9%, 90% and 97.2% were aware regarding the principles and components of Biomedical Waste management, 4 categories of biomedical waste and the color codes for waste disposal respectively. About the appropriate containers for disposal of cytotoxic drugs, metal sharps, human and animal anatomical waste, infected plastics, soiled dressings- 68.1%, 35.1%, 84.3%, 81.4%, 55.9% of the students got the correct answers respectively. Regarding the disinfection of bins containing waste from COVID wards, 76.7% of the students had chosen the correct option of using 1% sodium hypochlorite. About the question on the disposal of glass sharps, metallic body implants, placenta and microbiology waste, 47.8%, 60.1%, 84% and 69.5% of the students had given the correct answers respectively. 63.4% of the participant students answered correctly regarding the vaccination required for biomedical waste handlers.

Conclusion: When the responses were analysed, it was clear that students needed more training on the updated guidelines for biomedical waste management. Training on biomedical waste management should be carried out at regular intervals followed by assessment and retraining. Health care workers, the patients, visitors to healthcare facility and the support staff will be immensely benefitted by this.

KEYWORDS

Biomedical waste management, Awareness, Medical students

INTRODUCTION

The Ministry of Environment and forests defines biomedical waste as any waste that is generated during the medical diagnosis, treatment or during immunization of human beings or animals and waste generated during research activities pertaining to the production or testing of biologicals⁽¹⁾. Biomedical waste refers to any type of waste that is generated in healthcare facilities, research and clinical laboratories^(1,2,5). The waste that is generated in healthcare facilities carries potentially infectious agents. Therefore, it is essential to safely segregate and dispose infectious waste generated in hospitals. The Government of India introduced the first regulations of Bio medical Waste Management and Handling rules in July 1998⁽⁴⁾. These BMW rules were amended in 2011 and then in March 2016 and with minor amendments in 2018 and 2020, to include the guidelines for COVID waste.⁽⁴⁾ Though these rules exist to reduce the effect of this infectious waste on the community, they are not fully implemented⁽⁵⁾. The main reason for this is lack of awareness of the proper methods for biomedical segregation and waste disposal.

As per the World Health Organization data, 85% of hospital waste is non-hazardous (paper, cardboard, flowers, kitchen waste, etc.). And the 15% of the hazardous waste include both infectious and noninfectious waste of which 10% is infectious and 5% is non-infectious but remain hazardous (chemicals - methyl chloride, formaldehyde, etc.).⁽⁶⁾ The amount of Health care waste generated is 0.5 to 2.0 kg/bed/day.⁽⁷⁾

Adequate knowledge of the hazards of healthcare waste, technique of segregation and waste handling will go a long way in the safe disposal of hospital waste.⁽⁵⁾ Every health care professional is expected to gain

complete knowledge and to practice according to the waste disposal guidelines. The amount of waste generated in each hospital varies. This recent guideline mandates every health care facility to properly segregate, disinfect and dispose its biomedical waste in an eco-friendly manner. Successful waste management program depends on segregation of waste at source and treatment of each category of waste in a suitable manner.

The first step towards a sustainable practice of proper biomedical waste disposal is the training and retraining of the undergraduate medical students, in the formative years of their medical career. They should be assessed periodically for areas requiring improvement and then necessary corrective action should be taken. Following this, the medical postgraduates should also be considered as a vital group as they will be employed as faculty in the forthcoming years and also will be in charge of training their students.

Initially as per the biomedical waste management guidelines (1998), the categories of biomedical waste were 10. Now with the present guidelines, there are only 4 categories of biomedical waste (2016). These guidelines were again modified in 2018 and then again in 2020 to include the waste disposal protocol for Covid treating facilities.

This study was aimed to determine the awareness about the updated biomedical waste management guidelines among the undergraduate medical students in a teaching hospital. The necessary information was collected by using a questionnaire which was distributed online. The results were analyzed and corrective measures were undertaken with special focus on the units which required more training.

MATERIALS AND METHODOLOGY

Study Design:

Prospective cross-sectional questionnaire-based study. The study was carried out using predesigned, semi-structured questionnaire designed on Google forms. (Table:1)

The study was conducted at Chettinad Hospital and Research Institute and the duration of study was 1 month.

Sample size: A total of 214 undergraduate and postgraduate medical students were assessed.

Subject Selection:

Inclusion Criteria: The study included students who were willing to participate in the study, both Undergraduate and postgraduate medical students.

Exclusion Criteria:

Students not available at the time of the study and not belonging to the medical stream. The Institutional Human Ethics Committee approval was obtained prior to commencing the study (Ref. No: IHEC-II/0079/21). The questionnaire comprising of 33 questions on biomedical waste management was designed with equal weightage being given to all the aspects of Biomedical Waste Management. Then it was incorporated into google forms.

This was peer reviewed by other faculty belonging to department of Microbiology. Then the Google forms link was shared to the students and the responses were collected and analyzed.

RESULTS

214 students were enrolled in this study, Google forms link was shared with the students, which they filled up and submitted in 30 minutes.

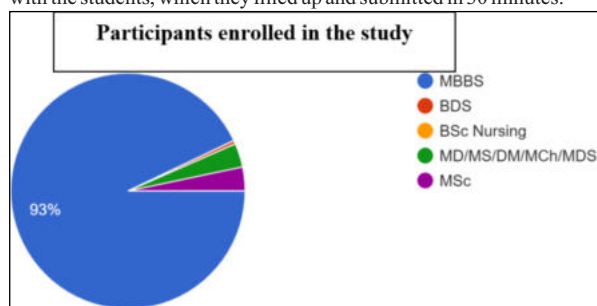


Figure 1

Figure 1 shows the percentage of the student participants belonging to various streams. 214 students were enrolled in this study, of which the majority were MBBS students (93%) followed by MSc and MD/MS students (7%). (Figure:1) 93.9% of the students were undergraduate and the rest were postgraduate students and 94.8% of the students belonged to the age group of 17 to 25 years.(Figure:2)

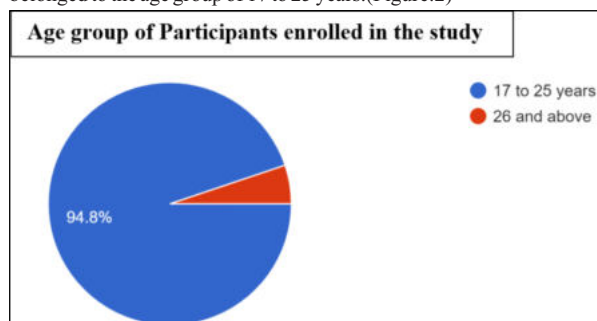


Figure 2

Table:1 Biomedical Waste Management Questionnaire

S. No	Questions	Percentage of correct Responses
1.	Define Biomedical waste	45%
2.	Are you aware of the Government regulations and Legislations on biomedical waste management	93%

3.	Biomedical Waste management is regulated by	89.5%
4.	Biomedical Waste management guidelines were first implemented in the year	89.1%
5.	Have you undergone any training on Biomedical Waste Management	52.6% (not aware)
6.	Biomedical waste generated in a hospital should NOT be stored for more than	43.8%
7.	What proportion of hospital waste is nonhazardous general waste	90.4%
8.	What proportion of healthcare waste is hazardous waste	79.4%
9.	All of the following are Principles of Biomedical Waste Management except	77.9%
10.	How many categories of Biomedical Waste?	90%
11.	Awareness about color codes for Biomedical waste disposal	97.2%
12.	Cytotoxic and expired drugs are disposed in bag by	68.1%
13.	Metal sharps (needles and fixed needle syringes) are disposed in to	35%
14.	Human and Animal Anatomical Waste is disposed into	84.3%
15.	Non-biodegradable infectious waste like catheter, tubing and gloves should be discarded in which color coded bag	81.4%
16.	Articles soiled with blood, bodily fluids like cotton, dressing, plaster casts, swabs, etc.,	55.9%
17.	The outer and inner surface of the COVID 19 waste bins and trolleys should be disinfected with	76.7%
18.	Liquid biomedical waste is disposed of by	68.4%
19.	Waste from COVID 19 isolation ward is collected in	59.1%
20.	Sharps are disposed of by	66.2%
21.	Autoclaving and microwaving are done for which of the following types of medical waste	52.6%
22.	Glass sharps are discarded into	47.6%
23.	The color code of plastic bag for disposing of microbial laboratory culture waste	69.5%
24.	The placenta is disposed of in a color bag	84%
25.	High priority in triage is for	83%
26.	False statement about yellow bags is	70.7%
27.	All the following waste can be incinerated except	
28.	Metallic body implant should be disposed of in	60.1%
29.	Blood bag is disposed of in	63.4%
30.	Best for incineration of infectious waste	69.9%
31.	The cover of the Foley's catheter used for a HBsAg positive patient is disposed of in a bag	42.9%
32.	Which vaccination should be given to workers who handle biomedical waste	63.4%
33.	What is the amount of biomedical waste generated per bed in a hospital	78.9%

About 52.6% of the individuals have not undergone training on Biomedical waste management and is a frequently missed question by the participants and others include, Biomedical waste generated in a hospital should not be stored more than 48 hours, Metal sharps like needles and fixed needle syringes are disposed into, glass sharps are discarded into and the cover of the Foley's catheter used for a HBsAg positive patient is disposed in which color-coded bag

DISCUSSION

This study was initiated with the purpose of ascertaining the knowledge of the medical undergraduates and postgraduates on the various aspects of biomedical waste management guidelines. It is mandatory that every physician should know the correct method of Biomedical waste segregation, treatment and disposal of the same.

This study was carried out on 214 students, both undergraduate and postgraduate students but the majority of the students who took the test were undergraduates. Once the test was administered, the results were analyzed and compiled.

214 students were enrolled in this study, of which the majority were

MBBS stream (93%) followed by MSc and MD/MS students (7%). 93.9% of the students were undergraduate and the rest were postgraduate students and 94.8% of the students belonged to the age group of 17 to 25 years (Figure 2). 89.5% of the students identified correctly, the regulating agency for Biomedical waste management in India. A study by Malini Capoor *et al* states that 73% of the doctors were aware of the legal aspects and administration.⁽⁴⁾ Regarding the definition of biomedical waste 45% got the correct response, whereas in a study by Balajiet al 96% got the correct definition.⁽⁸⁾

For the question on the year of implementation of Biomedical waste regulations (1998) in India for the first time, 89.1% of the students got the correct answers. For the question on whether the students were trained earlier on Biomedical waste, 47.4% answered yes and 52.6% answered no.

Concerning the question on the quantity of BMW generated per day, 78.9% of the students got it correct at 0.5 to 2.5 kg per bed per day. Regarding the principles and components of Biomedical Waste management, 77.9% got the correct answers. 90% of the students answered correctly that there were 4 categories of Biomedical waste, as per the latest guidelines and 97.2% were aware of the color codes for waste disposal. Regarding the appropriate containers for disposal of cytotoxic drugs, metal sharps, human and animal anatomical waste, infected plastics, soiled dressings- 68.1%, 35.1%, 84.3%, 81.4%, 55.9% of the students got the correct answers. A study by Vanesh Mathur et al, 92% of the doctors got the color coding correct⁽⁵⁾.

Regarding the disinfection of bins containing waste from COVID wards, 76.7% of the students had chosen the correct option of using 1% sodium hypochlorite. Regarding the disposal of Liquid biomedical waste and sharps, 68.4% and 66.2% of the students had marked the correct answers. Regarding the question on the disposal of glass sharps, metallic body implants, placenta and microbiology waste, 47.8%, 60.1%, 84% and 69.5% of the students had given the correct answers. 135 (63.4%) of the students had given the correct answer for the appropriate container for blood bag disposal. 63.4% of the participant students answered correctly regarding the vaccination required for biomedical waste handlers. In Capoor et al's study, 84 % of the doctors were aware of the appropriate biomedical waste containers to be used.⁽⁴⁾

Corrective Action:

From the above analysis, it was clear that students needed more training on the updated guidelines for biomedical waste management. The questions which most of the students missed answering were also noted. Additional lectures and practical hands-on training were arranged for the students.

A retest was given to the students after the retraining program and they fared much better and all the students scored 100%.

Preventive Action:

The medical students, nursing and allied health sciences students must be trained and retrained on the hospital infection control measures such as hand hygiene, biomedical waste disposal, standard precautions, safe injection practices, needle stick injury protocol etc, on a regular basis. This will enable them to become practicing physicians or surgeons with a sense of responsibility and who in turn will train their students and subordinates.

CONCLUSION

Training on biomedical waste management should be carried out at regular intervals followed by assessment and retraining. Health care workers, the patients, visitors to healthcare facility and the support staff will be immensely benefitted by this. Similar studies can be conducted to cover more participants and large-scale training programs can be planned and carried out.

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