

How to Cite:

Bathma, V., Chhari, N., & Tiwari, S. (2022). Bio-medical waste management rule 2016, an educational intervention study among postgraduate students in a tertiary care center: A study from central India. *International Journal of Health Sciences*, 6(S6), 9397–9403. <https://doi.org/10.53730/ijhs.v6nS6.12524>

Bio-medical waste management rule 2016, an educational intervention study among postgraduate students in a tertiary care center: A study from central India

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Abstract---Introduction: Healthcare is one of the fastest growing sectors in India. The healthcare facilities are a basic requirement of human kind but these are also sources of life threatening wastes and toxins. Objectives: To assess the existing level of knowledge regarding 'bio-medical waste management rule 2016 and evaluate the effectiveness of educational intervention and also find out association between assessment of knowledge before and after results. Material and methods: An interventional trial was conducted using video lecture and slide show as a tool. Assessment with use of questionnaire for evaluation was used with scoring. A study was conducted in a tertiary care hospital attached to the medical college, in Bhopal. All 1st year PG students were included in study from different departments. Total 28 PG students were included from various departments. Study was conducted in phase manner with objective of imparting knowledge regarding waste management practices. Results: There was significantly increase in knowledge about bio-medical waste management after educational intervention which was statistically highly significant ($p < 0.0001$) except symbol of biohazard Conclusion: The knowledge of the 1st year PG medical student regarding BMW management varied and was not found to be satisfactory. The intervention proved to improve that knowledge to significant level.

Keywords---assessment, knowledge, biomedical waste management (BMW), intervention.

Introduction

Health care waste is a unique category of waste by the quality of its composition, source of generation, its hazardous nature and the need for appropriate protection during handling, treatment and disposal. Mismanagement of the waste affects not only the generators, operators but also the common people too.¹ "Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or Immunization of human beings or animals or research activities pertaining thereto or in the Production or testing of biological or in health camps, including the categories mentioned in Schedule I appended to these rules. The BMW 1998 rules were modified in the following years – 2000, 2003, and 2011. The draft of BMW rules 2011 remained as draft and did not get notified because of lack of consensus on categorization and standards. Now Ministry of Environment, Forest and Climate change in March 2016 have amended the BMW rules. These new rules have increased the coverage, simplified the categorization and authorization while improving the segregation, transportation and disposal methods to decrease environmental pollution. It has four schedule, five forms and eighteen rules.²

If this waste is categorized as infectious waste per se then it will increase the quantum of waste leading to increase in both financial as well as labour cost. Hence it is imperative to segregate the waste at the site of generation or at the location of their use.³ Healthcare is one of the fastest growing sectors in India. The healthcare facilities are a basic requirement of human kind but these are also sources of life threatening wastes and toxins. According to World Health Organization reports, 85% of hospital wastes are actually non-hazardous, whereas 10% are infectious and 5% are non-infectious.⁴ Data from Government of India site indicates the total BMW generated in the country is 484 TPD (tonnes per day) from 1, 68,869 HCFs. Unfortunately, only 447 TPD is treated, and 37 TPD is left untreated. There are 198 CBMWTF in operation and 28 under construction. The numbers of HCFs using CBMWTFs are 1, 31,837, and approximately 21,870 HCFs have their own treatment facilities on-site.²

India approximately generates 2 kg/bed/ day⁵ and this biomedical waste encompasses wastes like anatomical waste, cytotoxic wastes, sharps, which when inadequately segregated could cause different kinds of deadly infectious diseases like Human immunodeficiency virus(HIV) hepatitis C and B infections, etc,⁶ and also cause disruptions in the environment, and adverse impact on ecological balance.^{7,8} In India hospitals and other health care establishments are not well equipped to handle the enormous amount of biomedical waste. There is an urgent need to raise the awareness amongst all concerned. Information can be disseminated through organizing seminars, workshops, practical demonstrations, group discussions, lectures etc. It is vital to formulate an effective education and training programs specific for different target groups involved in biomedical waste handling and management.⁹In few hospitals there is no proper training or any

educational intervention of the students in bio-medical waste management. This indicates the lack of even basic awareness among hospital PG students regarding proper segregation of Bio-Medical waste. Keeping in view the above scenario, the present study has been undertaken to assess the knowledge and give intervention educational training regarding different aspects of Bio-medical waste management rule 2016 amongst PG students of a tertiary care hospital in Bhopal, Madhya Pradesh to evaluate the effectiveness of intervention method used.

Objectives of the study

To assess the existing level of knowledge and evaluate the effectiveness of educational intervention and also find out association between before and after test knowledge score.

Material and Methods

An educational intervention study conducted at a tertiary care teaching hospital attached to the medical college, in Bhopal. All 1st year PG students were included in study from different departments. Total 28 PG students were included from all departments. It is assumed that individuals participate in this study will cooperate and will give correct response. After explaining purpose and type of study, verbal consent was obtained from each participant. Study was conducted in two phase using video demonstration, didactic lecture and slideshow. Before and after questionnaire for evaluation was used with scoring.

Before Assessment- phase I

A pretested self administrative questionnaire was given to each student. It contains questions about knowledge regarding Bio-medical waste management rule 2016. Total 10 questions were asked regarding new rule of segregation procedures colour coding and waste treatment methods etc. 10 minutes time was given to complete their questionnaire. Identities were kept confidential. Knowledge was asses by response to questions regarding each of these.

After Assessment- phase II

Educational intervention was conducted for all PG students. A lecture session with power point presentation on various aspects regarding new rule of BMW management, treatment methods, followed by demonstration of colour coded bags, different equipment and importance of segregation practice was conducted. This was followed by interactive session, in which participants ask regarding practical problems in the application of new rule of BMW(M) was discussed. After the session the questionnaire was given to them. Statistical analysis was done by using tools like SPSS 20 or MS. Excel for paired sample T Test, χ^2 (chi-square) test and percentage.

Results

This study shows that knowledge and awareness regarding Bio- Medical Waste Management rule 2016 among the 1st year PG students in Tertiary Care teaching

Hospital, Bhopal was not so good. Overall positive change was found in knowledge and awareness after educational intervention. There was significantly increase in knowledge about new rule of bio-medical waste management before and after educational intervention which was statistically highly significant ($p < 0.0001$)

Table 1
Analysis regarding effectiveness of educational intervention (Paired Samples T-Test)

Paired Samples Statistics							
Test	mean	N	Std. Deviation	Std. Error Mean	Coefficient of Correlation	t	P
Pre-test	3.93	28	1.388	.253	.370	-12.042	.000*
Post-test	7.27	28	1.311	.239			

*Highly significant

Sig. (2-tailed) p -value = $0.000 < 0.01$, the difference between the pre test and post test scores is highly significant this shows that the educational intervention on new rule of Bio-Medical Waste Management is very effective. (Table 1)

Table 2
Knowledge assessment of 1st year PG students regarding bio-medical waste management rules 2016 (N=28)

Variable	Pre-test		Post-test		χ^2 (p.value)
	Aware (%)	Unaware (%)	Aware (%)	Unaware (%)	
Bio-medical waste management rule 2016	4 (14.28)	24 (85.71)	27 (96.42)	1 (3.75)	38.224 (.05)
Color coding category of waste	6 (21.42)	22 (78.57)	18 (64.28)	10 (35.71)	10.5 (.001)
Time of Storage of Bio-medical waste	17 (60.71)	11 (39.28)	27 (96.42)	1 (3.75)	10.606 (.001)
Punctures proof container	16 (57.14)	12 (42.85)	23 (82.14)	5 (17.85)	4.139 (.04)
Discarded medicine to be dump	2 (7.14)	26 (92.85)	17 (60.71)	11 (39.28)	17.923 (.000)
Symbol of biohazard	24 (85.71)	4 (14.28)	27 (96.42)	1 (3.75)	1.9765* (.159)
Method of disposal of waste	20 (71.42)	8 (28.57)	27 (96.42)	1 (3.75)	6.487 (.010)
Type of waste required no container	19 (67.85)	9 (32.14)	25 (89.28)	3 (10.71)	3.818* (.050)
Incineration/ plasma pyrolysis	13 (46.42)	15 (53.57)	24 (85.71)	4 (14.28)	9.638 (.001)
Use of cardboard container	6 (21.42)	22 (78.57)	17 (60.71)	11 (39.28)	8.927 (.002)

* Statistically not significant

Table 2 shows that, majority (85.71%) of the respondents were already having prior knowledge about Symbol represent biohazard (schedule IV, Part 'A') of Bio-medical waste. There is increase in knowledge after intervention Educational training, but it is not statistically significant. Only 21.24% of the participants were aware about Color coding category of waste and it was significantly increased (64.28%) after creating awareness through educational intervention. About half of the subjects did not know about color coding system, precautions while handling Bio-medical waste and Bio-medical waste handling rules. The knowledge was significantly increased after giving intervention Educational training and it is found to be statistically significant. 60.71% and 30 % of the study subjects knew about storage of Bio-medical waste (up to 48 hours) and different treatment methods (eg., disinfection by using 1% sodium hypochloride solution) of Bio-medical waste respectively. The knowledge was increased after educational intervention it is statistically significant. Only 71.42% of the participants were aware about disposal methods of Bio-medical waste and the awareness was increased up to 96.42% after Educational intervention session and the increase in knowledge was found to be statistically significant. There was a highly statistical significance increase in the knowledge in all aspects of Bio-Medical waste management after Educational intervention when compared to before Educational intervention except symbol of biohazard (schedule IV, Part 'A').

Discussion

The present study was conducted to assess the knowledge of Bio-medical waste management as well as to know the impact of educational intervention training in increasing the knowledge. In this study, the knowledge of Bio-medical waste management rule was poor in many aspects before obtaining training because of lack of training in the past. In a study conducted by Rao D, Dhakshaini M. R, Kurthukoti A, Doddawad V.G in 2018, the knowledge, attitudes and practices towards biomedical waste management among the study respondents was satisfactory. They found that Knowledge, attitude and practices toward biomedical waste management were better among the nurses and doctors than the other cadre of staff.¹⁰

The segregation of Bio-medical waste at the point of generation is very important for the disposal of waste. This study showed that the knowledge about segregation of Bio-medical waste was very less (30%) among the participants and more than half (53.33%) of the study subjects were unaware about color coding of Bio-medical waste and The study also showed that (53.33%) of the subjects did not know about the Bio-Medical waste Management rules before the training and only (50%) of them knew about the storage of Bio-medical waste up to 48 hrs. in present study knowledge was significantly increased after training session and was found to be statistically significant. The study done B.S.Mannapur et al at Bagalkot city showed similar findings.¹¹

The present study revealed that 1st year students had better scores in knowledge test score which was done after training session on the subject. As evident the awareness level got improved after the training which clearly indicates the effectiveness of educational intervention training to study participants. In present study the difference between the Pre and Post test scores were highly significant.

Similar findings were seen in a study conducted by Shishir Basarkar¹² in Mumbai, they revealed statistically significant difference was found among members who received training of bio-medical waste management which is evident from the rise level of knowledge. Similar findings revealed by Manish Patidar et al,¹³ they found pre and post test score is highly significant show that the effectiveness of structured teaching program. El Sayed et al also found similar findings of an intervention program.¹⁴

Conclusion

The present study revealed that participants had better scores in knowledge test score after training session on the subject. As evident the awareness level got improved after the training, this clearly indicates the effectiveness of educational intervention training to study participants.

Recommendation

Training programs are required to conduct for healthcare professionals on biomedical waste management as per the new Bio medical waste management rules 2016. Various IEC strategies like handouts, stickers, charts, can help in better practices of the employees of the institute. All health care professionals regardless of their designation, experience must be included in the trainings, so that it can prevent infections among the hospital staff and patients in the health care sector.

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