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Research Article

A cross sectional study amongst paramedical workers and nursing students regarding awareness of various aspects of biomedical waste (management and handling) rules

Rekha Acharya, Gaurav Sharma*, Renu Sethia, Rattiram Meena

Department of PSM, S. P. Medical College, Bikaner, Rajasthan, India

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***Correspondence:**
Dr. Gaurav Sharma,
E-mail: g.sha37@gmail.com

ABSTRACT

Background: Various type of waste are produced during healthcare activities. Such waste generated has more chances of causing serious infection and also injury to persons coming in contact with them directly or indirectly. Lack of adequate and appropriate knowledge of handling of healthcare waste may lead to serious health consequences to such persons and have significant adverse impact on the environment as well. The objective of the study was to assess the level of Awareness of various aspects of Biomedical Waste (Management and handling) Rules amongst paramedical workers and nursing students.
Methods: This was a cross-sectional study. The study was conducted amongst paramedical workers and nursing students posted at Prince Bijay Singh Memorial (PBM) and Associated Group of Hospitals Attached to Sardar Patel Medical College, Bikaner.
Results: Out of 607 respondents, maximum (57%) were Paramedical workers followed by General Nursing and Midwifery (G. N. M) students (24.7%), and B.Sc. nursing students (18.3%). Majority (70.6%) of the participants didn't have any training on Biomedical Waste management. 20.6% of study population had poor awareness regarding various aspects of Biomedical Waste Management. Highly significant difference was seen when awareness of various professional group regarding different aspects of Biomedical Waste Management was compared.
Conclusions: The lack of proper and complete awareness about Biomedical Waste Handling and management rules impacts practice of appropriate waste disposal leading to serious health consequences, thus there is need to reinforce and update knowledge of health care workers on the subject.

Keywords: Biomedical waste, Paramedical workers, G.N.M. students, B.Sc. Nursing students

INTRODUCTION

Hospital waste refers to all waste generated in hospital whether biological or non-biological that is discarded. Medical waste is a subset of hospital waste; it refers to the material generated as a result of diagnosis, treatment or immunization of patients and associated biomedical research. Biomedical waste is generated in hospitals, research institutions, health care teaching institutes, clinics, laboratories, blood banks, animal houses and veterinary institutes. [1,2]

With a rapid increase in the number of hospitals, clinics and laboratories in the country, the generation of health

care waste has been increasing considerably. According to WHO reports, between 75% and 90% of the waste produced by health-care providers is non-risk or "general" health-care waste, comparable to domestic waste. It comes mostly from the administrative and housekeeping functions of health-care establishments and may also include waste generated during maintenance of health-care premises. The remaining 10–25% of healthcare waste is regarded as hazardous and may create a variety of health risks.[3]

In country like India where there is big and complex health care system, mixed economy, private and government hospitals working together; the quantity of waste generated from hospitals ranges between 0.5 and 2.0 kg/bed/day and 0.33 million tons per year.[4] In India percentage of infectious waste is much higher because of improper segregation methods resulting in collection of biomedical waste in a mixed form.

The concern regarding the medical waste is mainly because of various infectious pathogenic organisms and other harmful organic substances which are present in high concentrations in hospital solid wastes. Infectious healthcare waste can transmit more than 30 dangerous blood-borne pathogens, but those of primary significance to Health Care Workers are hepatitis B, hepatitis C and Human immune deficiency virus (HIV).[3,5]

Pursuant to the directives of the Honorable Supreme Court, the Ministry Of Environment and Forests, Government of India issued certain draft rules called biomedical waste management and handling rules, 1995.

Till July 1998, there was no system for proper hospital waste disposal. Most of the hospitals were disposing their waste along with general waste. For prevention of these improper practices, the notification served by the Ministry of Environment and Forests, Government of India on 27th July, 1998 called as "Bio-medical waste management and handling rules" 1998 (amended in 2000 and 2003). These rules have been made by the central government, in exercise of the power conferred by sections 6, 8 and 25 of the environment (protection) act, 1986. Further amendments have been done. Recently draft rules which may be called the "Bio-Medical Waste (Management and Handling) Rules, 2015" have been published for discussion and are appreciable for the fact that it will eliminate the overlapping in categories which earlier had made segregation and disposal difficult to understand and comply with for health care staff.[6]

The Bio-medical waste (management and handling) Rules, 1998 lay down clear methods for disposal of bio-medical waste. Pollution control boards of every state have been given the task of authorizing and implementing the rules. The main rules are only described pertaining to segregation, collection and transportation.[6]

Since the implementation of Bio-medical waste rules (1998), every health personnel are expected to have proper knowledge about collection, handling, and disposal of BMW.[7] However, lack of awareness has led to the hospitals becoming a hub of spreading disease rather than working toward eradicating them.[8]

Keeping this in view, the present study was carried out to assess the awareness about various important aspects of Biomedical Waste (Management and Handling) Rule, among the Health Care Workers (GNM Students, B.Sc. Nursing Students and Paramedical workers) of a tertiary care hospital of Bikaner, Rajasthan, so that this current status of respondent's Awareness regarding Bio-Medical Waste Management will help not only to improve implementation and ensuring compliance of Act provisions but also to frame strategy accordingly.

METHODS

Present study, a cross sectional study conducted among the Paramedical workers and Nursing Students (General Nursing and Midwifery and B.Sc. Nursing) who were posted in various department of Sardar Patel Medical College and associated group of Hospitals, Bikaner – Rajasthan (India) at the time of the study.

The study was carried out from Oct. 2012 to Jan. 2013 after taking written permission from the Principal and other appropriate authorities.

Endeavour was made to include all paramedical workers and nursing students posted in Sardar Patel Medical College and associate group of Hospitals during the period of study. 607 Workers could be interviewed who were physically present and were willing to participate in the study.

In order to obtain a free and true response each person contacted at his/her work place personally and consent was taken after thoroughly explaining the objective of the research and assuring them of confidentiality.

The data was collected using a predesigned and pretested schedule and the questions were asked individually in Hindi or local Language of Bikaner.

The schedule has 33 close ended multiple choice questions from all the various important aspects of Biomedical Waste (Management & Handling) Rule, 1998, framed in five separate sections.

Section: 1. Generation, definition & classification of BMW = 6 items
Section: 2. Segregation and colour-coding = 10 items
Section: 3. Storage and transport = 4 items
Section: 4. Treatment disposal methods = 9 items
Section: 5. Administrative aspects = 4 items

The data was entered in MS excel. Scoring of level of awareness was done as explained below. Appropriate statistical test were applied as per need of the study.

Scoring of awareness

For every correct response by respondent a score of +1 was given and for every wrong answer, a score of "0" was given. The level of awareness on the basis of their total score was classified into 3 levels: Poor, Fair and Good.

Table 1: Section wise scoring for level of awareness regarding biomedical waste management and handling.

Maximum score	Range of score	Level of Awareness
Section 1: Generation, Definition and Classification		
6	0-2	Poor
	3-4	Fair
	5-6	Good
Section 2: Segregation and Colour-coding		
10	0-4	Poor
	5-7	Fair
	8-10	Good
Section 3: Storage and Transport		
4	0-2	Poor
	3	Fair
	4	Good
Section 4: Treatment and Disposal methods		
9	0-3	Poor
	4-6	Fair
	7-9	Good
Section 5: Administrative aspects		
4	0-2	Poor
	3	Fair
	4	Good
Overall Level of Awareness regarding BMW		
33	0-13	Poor
	14-23	Fair
	24-33	Good

RESULTS

Out of 607 respondents, maximum (57%) were Paramedical workers followed by GNM students (24.7%), and B.Sc. nursing students (18.3%). Majority (70.6%) of the participants didn't have any training on Biomedical Waste management.

85% of study population had fair and good awareness regarding definition, generation and classification of biomedical waste but only 63.1% had awareness regarding colour coding and segregation of biomedical waste.

Also around half of the respondents had awareness about storage and transportation, treatment and disposal methods of biomedical waste.

Table 2: Awareness of study population regarding various important aspects of biomedical waste management.

Awareness regarding definition, generation and classification of Biomedical Waste Management	N (%) n= 607
Good	204(33.6)
Fair	313(51.6)
Poor	90(14.8)
Awareness about Colour coding and Segregation of Biomedical Waste Management	
Good	117(19.3)
Fair	266(43.8)
Poor	224(36.9)
Awareness about Storage and Transportation of Biomedical Waste Management	
Good	132(21.7)
Fair	199(32.8)
Poor	276(45.5)
Awareness about Treatment and Disposal methods of Biomedical Waste Management	
Good	29(4.8)
Fair	277(45.6)
Poor	301(49.6)
Awareness regarding Administrative aspects of Biomedical Waste Management	
Good	38(6.3)
Fair	185(30.5)
Poor	384(63.2)

Respondents had the least awareness regarding administrative aspects of biomedical waste management (Table 2).

Table 3: Overall awareness of study population regarding biomedical waste management.

Awareness	N (%)
Good	67(11.0)
Fair	415(68.4)
Poor	125(20.6)
Total	607(100.0)

Majority (79.4%) of study population had fair to good overall knowledge whereas only 20.6% of study population had poor awareness regarding various aspects of biomedical waste management (Table 3).

The association between different professional group and their awareness regarding definition, generation and classification, colour-coding and segregation of biomedical waste and also awareness regarding storage and transportation of biomedical waste was found to be

statistically highly significant. Regarding treatment and disposal of biomedical waste management and difference in awareness regarding administrative aspects of biomedical waste management was also significant statistically. Paramedical workers were the most aware of all and B. Sc. Nursing students had the poorest awareness (Table 4).

Highly significant difference was seen when awareness of various professional group regarding different aspects of Biomedical Waste Management was compared. 87% of paramedical workers had fair to good overall awareness in comparison to GNM Students (74%) and B.Sc. nursing students (67.1%) (Table 5).

Table 4: Association between the awareness of study population regarding various important aspects of biomedical waste management with their professional groups.

Definition, Generation and Classification of Biomedical Waste				
Professional Groups	Awareness			Total Number
	Poor	Fair	Good	
	N(%)	N(%)	N(%)	
B.Sc. nursing students	37(33.3)	68(61.3)	6(5.4)	111
GNM students	17(11.3)	87(58.0)	46(30.7)	150
Paramedical Workers	36(10.4)	158(45.7)	152(43.9)	346
χ^2 = 74.6289,d=4, P = <0.001				
Colour coding and Segregation of Biomedical Waste				
B.Sc. nursing students	72(64.9)	32(28.8)	7(6.3)	111
GNM students	60(40.0)	51(34.0)	39(26.0)	150
Paramedical Workers	92(26.6)	183(52.9)	71(20.5)	346
χ2 = 62.85257, d=4, P = <0.001				
Storage and Transportation of Biomedical Waste				
B.Sc. nursing students	77(69.4)	22(19.8)	12(10.8)	111
GNM students	64(42.7)	57(38.0)	29(19.3)	150
Paramedical workers	135(39.0)	120(34.7)	91(26.3)	346
χ2 = 34.49246, d=4, P = <0.001				
Treatment and Disposal of Biomedical Waste				
B.Sc.nursing students	66(59.5)	37(33.3)	8(7.2)	111
GNM students	81(54.0)	60(40.0)	9(6.0)	150
Paramedical Workers	154(44.5)	180(52.0)	12(3.5)	346
χ2 = 15.47129, d=4, P = <0.01				
Administrative aspects of Biomedical Waste Management				
B.Sc. nursing students	82(73.9)	24(21.6)	5(4.5)	111
GNM students	101(67.3)	41(27.3)	8(5.4)	150
Paramedical workers	201(58.1)	120(34.7)	25(7.2)	346
χ2 = 10.44765, d=4, P = <0.05				

DISCUSSION

In the study out of 607 respondents, most (57%) were Paramedical workers followed by GNM students (24.7%), and B.Sc. nursing students (18.3%).

Majority (70.6%) of the participants didn't have any training on Biomedical Waste management so was also the case in study conducted by Joseph J. et al where 88% have not undergone any training on waste management though majority (85%) of them were interested in attending a program on Biomedical waste management.[9]

Low or lack of training reported in other studies also. Not only in India but studies from other countries also show that there is lack of training amongst health care worker either because they themselves lack the enthusiasm for new knowledge or lack of initiative taken by authorities.[10-12]

Thus there is need not only amongst health care staff but also among authorities to give serious thought to this matter and have more trainings, increase awareness, have health care worker understand the importance of proper management of bio medical waste so that it can be implemented in a better way.

Table 5: Association between the awareness of study population and their professional groups regarding various important aspects of biomedical waste management.

Professional Groups	Awareness			Total Number
	Poor	Fair	Good	
	N (%)	N (%)	N (%)	
B.Sc. nursing students	41 (36.9)	64 (57.7)	6 (5.4)	111
GNM students	39 (26.0)	96 (64.0)	15 (10.0)	150
Paramedical workers	45 (13.0)	255 (73.7)	46 (13.3)	346
Total	125 (20.6)	415 (68.4)	67 (11.0)	607
χ^2 = 34.85291, d=4, P = <0.001				

In study conducted by us more than 85% of study population had fair to good awareness regarding definition, generation and classification of biomedical waste. Similar findings were reported by Mrs. K Leena (2009) in her study.[13] Higher awareness reported in other study.[14] Lower awareness than our study has been reported by others regarding categories of Biomedical waste.[15,16] However study conducted by Shafee M, Kasturwar NB, Nirupama N (2010) showed very dismal figure, only 1.6% study subjects knew about categories of bio medical waste.[17]

63.1% of study subjects had awareness regarding colour coding and segregation of biomedical waste in our study.

Higher (72.6% to 93.6%) knowledge than our study reported in various studies.[13,14,16-18] Lower knowledge than our study regarding colour coding and segregation reported by others.[19,20]

Only around half of the respondents had awareness about storage and transportation, treatment and disposal methods of biomedical waste. Higher knowledge (around 75% in nursing staff) reported in various studies.[18,20] Lower knowledge than our study regarding treatment and disposal of biomedical waste management reported by Shafee M, Kasturwar NB, Nirupama N (2010) only 14.4% subjects had knowledge about various methods of disposal of BMW.[17]

Respondents had the least awareness (only 36.8% had fair to good awareness) regarding administrative aspects of biomedical waste management.

In present study, around 2/3rd (63.2%) of our study population had poor awareness regarding administrative aspects of biomedical waste management. In other studies also respondents were not aware of the existence of a legislation and majority not aware of authorization.[9,12] Higher knowledge than our study regarding existence of Biomedical Waste Management & Handling Rule, 1998 in health care workers reported in others.[18]

Overall 79.4% of study population had fair to good overall knowledge whereas only 20.6% of study population had poor awareness regarding various aspects of Biomedical Waste Management.

The association between different professional group and their awareness regarding definition, generation and classification, colour-coding and segregation of biomedical waste and also awareness regarding storage and transportation of biomedical waste was found to be statistically highly significant.

Regarding treatment and disposal of biomedical waste management and difference in awareness regarding administrative aspects of biomedical waste management was also significant statistically.

Highly significant difference was seen when awareness of various professional group regarding different aspects of Biomedical Waste Management was compared. Others also found statistically significant difference in knowledge of different professional group regarding biomedical waste management rules.[17,18]

The difference in knowledge clearly shows that those who are working in hospital since long and are more experienced are more aware. Students though they are taught but as they lack practical experience are not that aware.

CONCLUSION

So we can conclude that there is urgent need of comprehensive training programs regarding Bio Medical Waste (Management & Handling) Rule, for all the level of health care workers. All aspects of biomedical waste management should be practically demonstrated and Periodic CME sessions should be held in hospitals as it would help reinforce and update knowledge of the different categories of employees on the subject of Biomedical Waste management and motivate them to comply with the rules and guidelines regarding Biomedical Waste management.

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