

Impact of educational intervention on the knowledge of biomedical waste management among healthcare workers in the tertiary care district hospital, Shahjahanpur, U.P.

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Abstract

Biomedical waste management has recently emerged as an issue of major concern not only to hospitals, nursing home authorities but to the environmental & law enforcement agencies, media and the general public also. A proper knowledge among the healthcare workers about the rules and regulations of BMW and a clear understanding of their roles and responsibilities in handling BMW can go a long way towards the safe disposal of hazardous hospital waste and protect the community from various adverse effects of the hazardous waste. **Material & Methods:** The study group comprised of health care personnel who included junior doctors, staff nurses, laboratory technicians and Class IV sanitary staffs working in the institution. The study subjects consisted of 115 respondents: 14 junior doctors, 33 nurses, 17 lab technicians and 51 sanitary staffs. An informed oral consent has been taken from the study subjects. **Result:** Assessments of the pre & post-test knowledge of nursing staffs & sanitary staffs shows that there was increase in post-test knowledge in average and good categories but decrease in poor category. Person injured from biomedical sharps/blood contaminated articles, biomedical waste material mixed with general waste were more in comparison to post-test knowledge and it is found to be statistically significant. **Conclusion:** From this educational interventional study, it is concluded that the paramedical staff was lacking in the correct knowledge in various aspects of Bio-medical waste management before training. The knowledge was significantly raised after the training session.

Keywords: BMW, Knowledge, Assessment.

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Introduction

Biomedical waste (BMW) is the waste generated during diagnosis, treatment or immunization of human beings or animals, or in research activities pertaining thereto, or in the production and testing of biologicals, and is contaminated with human fluids (Government of India; BMW rules 1998). Biomedical waste management has recently emerged as an issue of major concern not only to hospitals, nursing home authorities but to the environmental & law enforcement agencies, media and the general public also [1]. Bio-medical waste is forming approximately 12% of the total municipal solid waste stream. Some of the wastes are potential threat to the human health and environment [2]. In addition to infectivity of the waste, its highly toxic & variable radioactivity has increased public concern about treatment, transportation and ultimate disposal. At many places, authorities are failing to install appropriate systems due to non-availability of technologies, inadequate financial resource and absence of professional training on waste management [3]. The awareness is poor among various categories of health workers about environmental health including biomedical waste

management [4]. The management of Bio-medical waste is still in its infancy stage all over the world. There is a lot of confusion among the generators, operators, decision-makers & the general community about the safe management of bio-medical waste. The reason may be due to the lack of awareness. Hence, resource material on bio-medical waste management for hospital staffs including nurses is the need of the hour [5]. According to the studies conducted by the World Health Organization (WHO) in 22 developing countries the proportion of health-care facility (HCF) that do not use proper waste disposal methods range from 18% to 64% (WHO Fact sheet No. 253; 2011). In India, annually about 0.33 million tons of BMW is generated and rate ranges from 0.5 to 2.0 kg per bed per day [6]. In some hospital there is no proper training of the employees in hazardous waste management. This indicates the lack of even basic awareness among hospital personnel regarding safe disposal of Bio-Medical waste. A proper knowledge among the healthcare workers about the rules and regulations of BMW and a clear understanding of their roles and responsibilities in handling BMW can go a long way towards the safe disposal of hazardous hospital waste and protect the community from various adverse effects of the hazardous waste. Also being a teaching medical college adequate and appropriate knowledge of BMW management among the healthcare workers can have a pivotal role in dissemination of information to others. With this background this study was undertaken in view of assessing the existing knowledge of

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the healthcare workers in a tertiary care hospital regarding the management of BMW.

Objectives:

To determine the knowledge regarding the Bio-medical waste management among healthcare workers.

To evaluate the effect of the intervention program given to healthcare workers.

Materials and Methods

The present study is across sectional study carried out to assess and improve the knowledge of health care staffs of Pd. Ram Prasad Bismil, Autonomous State Medical College, Shahjahanpur, Uttar Pradesh. The study group comprised of healthcare personnel who included junior doctors, staff nurses, laboratory technicians and ClassIV sanitary staffs working in the institution. The study subjects consisted of 115 respondents:14junior doctors, 33 nurses,17 lab technicians and 51 sanitary staffs. An informed oral consent has been taken from the study subjects. The training was conducted in several phases, for this a schedule was prepared in advance keeping in mind the various categories of staff in the hospital and a date was fixed for the training of the respective staff in the month of July 2019. Each batch was given training by the Community Medicine, Microbiology, Pathology & Bio-chemistry department on the different aspects of biomedical waste management with powerpoint presentation and demonstration. The

participants were divided into four batches and each batch was trained on a separate day. Those who remained absent on the specified training day was included for the next training session. An identical pre and post-training questionnaire was designed which was pre-tested & structured and also validated by a pilot survey. They were administered to the above-mentioned paramedical staff. The knowledge was assessed by study proforma consisted of 12 multiple choice questions relating to Biomedical waste management i.e., color coding for segregation, storage, personal protective devices, prophylactic vaccination, treatment, disposal and the rule of Bio-medical waste management. The proforma was filled by study subjects before the start of the training and the same set off proforma was given to them at the end of the training session. Thus, the first was taken as pre-test and latter as a post-test. Each correct response was assigned one mark. Self-made scoring system was used to categorize the participants as having good, average and poor knowledge regarding the subject. Participants scoring more than 10 were graded as Good, between 6-10 as Average and those who scored less than were categorized as having Poor knowledge.

Statistical Analysis: The data was tabulated by using Microsoft Excel 2010 and analyzed by using Open Epi software and chi-square test is used to test the statistical significance of the difference observed in the knowledge of Bio-medical waste during pre-test & post-test.

Results

Table 1: Assessment of knowledge of healthcare personnel during pre and post-test

Category of Healthcare workers	Marks	Pre-Test		Post Test	
		Frequency	Percentage	Frequency	Percentage
Junior Doctors (n=14)	Poor	0	0.00	0	0.00
	Average	12	85.71	12	85.71
	Good	2	14.29	2	14.29
Nursing Staffs (n=33)	Poor	17	51.52	8	24.24
	Average	16	48.48	21	63.64
	Good	0	0.00	4	12.12
Lab Technicians (n=17)	Poor	5	29.41	6	35.29
	Average	11	64.70	7	41.17
	Good	1	5.88	4	23.53
Sanitary Staffs (n=51)	Poor	40	78.43	31	60.78
	Average	11	21.57	18	35.29
	Good	0	0.00	2	3.92

Table 1 shows that healthcare's knowledge regarding BMW was categorized into poor, average and good knowledge. Post teaching intervention was done after every pre-test session to each group of health care workers. Assessed the pre-test and post-test knowledge of Junior Doctors by questionnaire was found that there was no change in the knowledge in pre & post-test. Assessments of the pre & post-test knowledge of nursing staffs & sanitary staffs shows that there was increase in post-test knowledge in average and good categories but decrease in poor

category. Therefore, the teaching module on BMW management of knowledge was more effective in both average and good categories but not poor category among nursing staffs & sanitary staffs. Assessments of the pre & post-test knowledge of lab technician shows that there was increase in post-test knowledge in poor and good categories but decrease in average category. Therefore, the teaching module on BMW management of knowledge was more effective in both poor and good categories but not in average category among lab technician.

Table 2: Mean, SD, Mean difference, percentage and paired t-test regarding healthcare personnel knowledge on BMWM

S.N.	Healthcare personnel	Pre-test		Post-test		Mean difference	Mean %	Paired t test (p-value)
		Mean	SD	Mean	SD			
1	Junior Doctors (n=14)	9.28	1.28	11.5	0.73	2.22	74.21	0.001
2	Nursing Staffs (n=33)	5.51	2.55	7.42	2.47	1.91	39.18	0.000
3	Lab Technicians (n=17)	6.94	2.23	7.05	4.12	0.11	41.14	0.872
4	Sanitary Staffs (n=51)	2.84	2.66	4.21	3.49	1.37	6.91	0.009

Table 2 show that pre-test mean and standard deviation was 9.28 ± 1.28 , post-test was conducted after teaching intervention mean 11.5 ± 0.73 . The mean difference was 2.22 and mean percentage was 74.21, the paired t-test was 3.99. Hence teaching module enhanced the Junior doctor's knowledge. The mean score of the participants regarding knowledge of various aspects of BMW management improved pre-test to post test and the difference was highly statistically significant for junior doctors nursing staffs and sanitary staffs ($p < 0.0001$) while insignificant for Lab Technicians. The significant improvements in knowledge scores indicate success of the training program.

Table 3: Effectiveness of Teaching intervention

S.No	Test	Median	Interquartilerange	Wilcoxon signed rank
1	Pre-test	8	0-16	-1.5
2	Post-test	6.5	2- 18	

The table 3 shows that the practice skills of health care personnel's, pre-test median was 8 and interquartile range 0-16 in the pretest. The post-test observation was made after one day of intervention median was 6.5 and the interquartile range was 2-18. The effectiveness of the teaching intervention is assessed by Wilcoxon signed rank test was -1.5, after teaching intervention increased the practice skills of health care personnel. Also, the p-value (0.000) is found to be highly significant. which concludes that the medians are significantly different.

Table 4: Awareness of healthcare personnel regarding Bio-Medical waste management (n=115)

S.N.	Variables	Pre Test		Post Test		x ² value	p-value
		Aware (%)	Un-aware (%)	Aware (%)	Un-aware (%)		
1	What do you understand by biomedical waste?	50 (43.5)	65 (56.5)	59 (51.3)	56 (48.7)	1.41	0.23
2	Vaccination of health care workers could be done by which vaccine/vaccines?	53 (46.1)	62 (53.9)	56 (48.7)	59 (51.3)	0.15	0.69
3	Personal protective equipment's used by health care workers	75 (65.2)	40 (34.8)	76 (66.1)	39 (33.9)	0.02	0.88
4	Types of color-coded containers used in biomedical waste management	38 (33.0)	77 (67.0)	61 (53.0)	54 (47.0)	9.38	0.00
5	Infected sharp objects like needles, scalpel, blades etc are collected in beg	21 (18.3)	94 (81.7)	64 (55.6)	51 (44.4)	34.50	4.26
6	Infected broken glass & plastics are collected in which colored bag?	43 (37.4)	72 (62.6)	58 (50.4)	57 (49.6)	3.97	0.04
7	Placenta is collected & stored in which dustbin?	58 (50.4)	57 (49.6)	80 (69.6)	35 (30.4)	8.76	0.00
8	Waste papers generated in a hospital are collected in which dustbin?	28 (24.3)	87 (75.7)	60 (52.2)	55 (47.8)	18.84	0.00
9	Diseases transmitted through infected biomedical waste?	44 (38.3)	71 (61.7)	58 (50.4)	57 (49.6)	3.45	0.06
10	Person injured from biomedical sharps/blood contaminated articles should be reported?	76 (66.1)	39 (33.9)	89 (77.4)	26 (22.6)	3.62	0.049
11	What should be done, if we found biomedical waste material mixed with general waste?	14 (12.2)	101 (87.8)	32 (27.8)	83 (72.2)	8.80	0.00
12	When we come in contact with infected waste materials, then what steps should be taken for action?	43 (37.4)	72 (62.6)	52 (45.2)	63 (54.8)	1.45	0.22

Table 4 shows that, most (43.5%) of the respondents were already having prior knowledge about actual meaning of biomedical waste, Vaccination of health care workers, Personal protective equipment's used by health care workers, Collection of various infected sharp objects in the color-coded bags, Diseases transmitted through infected biomedical waste, Actions regarding person come in contact with infected waste materials. There is increase in knowledge after training, but these were not statistically significant. Knowledge regarding types of color-coded containers used in biomedical waste management, collection of infected broken glass, plastics, placenta and waste papers generated in a hospital in the appropriate colored bag, Person injured from biomedical sharps/blood contaminated articles, biomedical waste material mixed with general waste were more in comparison to post-test knowledge and it is found to be statistically significant.

Discussion

Analysis of data revealed that on all counts, doctors, nurses, and laboratory technicians have better knowledge than sanitary staff

regarding biomedical waste management. Knowledge regarding the color coding and waste segregation at source was found to be better among nurses and laboratory staff as compared to doctors. Study done by B.S Mannapur (2014)[7] et al in paramedical staff reported that majority (71.31%) of the respondents were already having prior knowledge about health hazards due to improper management of Bio-medical waste such as transmission of HIV, Hepatitis B and other infections. There is increase in knowledge after training. Only 31.97% of the training participants were aware about disposal methods of Bio-medical waste and the awareness was increased upto 56.56% after training session and the increase in knowledge was found to be statistically significant. In one of the study by Asadulla et al [8] it was found that only 28.9% of the nurses had complete knowledge regarding color coding and different categories of Bio-medical waste. Study conducted in Bhopal by Bathma et al [9] showed that 54.5% of nurses were aware about the existence of BMW management and handling rules. In a study conducted by Radha R at BG Nagara [10] showed that 37.3% of the nurses were having knowledge about storage. The study done by

Madhukumar S and Ramesh G at Bangalore showed that 87.5% of the study subjects were in favor of segregation [11]. Study done in Lucknow SGPGI found that after teaching intervention 100% nurses had adequate knowledge on biomedical waste management [12]. Similar study was conducted by Gupta et al. found that the knowledge of nursing staff was appreciable 70% [13]. Also nurses from rural area of Haryana staff had 73% knowledge and awareness on biomedical waste management [14].

Conclusion

From this educational interventional study, it is concluded that the paramedical staff was lacking in the correct knowledge in various aspects of Bio-medical waste management before training. The knowledge was significantly raised after the training session. All Medical staff is an integral part in health care delivery system hence all staff to be required periodically comprehensive training programs regarding handling, segregation, transportation & storage of hospital waste in color bins until final disposal and treatment. This requires motivation & interest of the concerned authority in the Government as well as private healthcare facilities. By increasing the awareness about Bio-medical waste management it is possible to prevent the transmission of many diseases and protect the healthcare workers.

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