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Original Research Article

Study of biomedical waste management among healthcare personnel at a Tertiary hospital in Lucknow district

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ABSTRACT

Background: Healthcare facilities are like a double-edged sword, it caters to the healthcare needs and problems of the people by providing curative, promotive or preventive services but in the process it inevitably produces waste which in itself is hazardous to health if not managed properly. In order to improve biomedical waste management, it is important to understand and evaluate the current practices in biomedical waste management, to identify the gaps and to address them. The study was conducted to assess the practice of biomedical waste management among the healthcare personnel at a tertiary hospital.
Methods: A hospital based cross sectional study was conducted among 314 healthcare personnel which comprised of 193 doctors, 85 staff nurses and 36 laboratory technicians. A pre-tested semi-structured questionnaire was used to collect the data.
Results: A total of 78% healthcare personnel had received training on BMW management. Most of the doctors (76.2%), staff nurses (70.6%) and laboratory technicians (72.2%) had received hepatitis B vaccination. And as for injection TT, 76.2% doctors, 85.9% staff nurses and 69.4% laboratory technicians had received it. Multivariate logistic regression showed association between waste segregation practices and occupation status and training which was statistically significant.
Conclusions: The study revealed satisfactory practices among the healthcare personnel. It also showed association between waste segregation practices and training on BMW management. The importance of training regarding biomedical waste management cannot be overemphasized, training and retraining on healthcare waste management should be given to healthcare personnel.

Keywords: Biomedical waste, Waste segregation, BMW training

INTRODUCTION

Demand of healthcare need has increased drastically over the last few decades and simultaneously the number of healthcare facilities has increased in order to cater to the demands and needs of the people. There by increasing the quantum of hospital waste production. According to WHO, of the total amount of waste generated by health-care activities, about 85% is general, non-hazardous waste and the remaining 15% is considered hazardous material that may be infectious, toxic or radioactive.[1] Although, the quantity of the infectious waste produced is less as compared to the overall healthcare waste, the poor waste management practices by healthcare workers mix the infectious waste with non-infectious waste and thereby contaminate the whole waste.[2]

Healthcare facilities are like a double-edged sword, it caters for the healthcare needs and problems of the people by providing curative, promotive or preventive services but in the process it inevitably produces waste which in

itself is hazardous to health if not managed properly. Improper handling of waste not only possess significant risk of infection due to pathogens like HIV, hepatitis B and C virus but also carries the risk of water, air and soil pollution thereby adversely affecting the environment and community at large.[3,4] In order to improve biomedical waste (BMW) management, it is important to understand and evaluate the current practices in BMW management, to identify the gaps and to address them. In view of this the present study was undertaken to assess the BMW management practices among the healthcare personnel in the tertiary care hospital and to recommend suitable measures to improve BMW practices among healthcare personnel based on study findings.

METHODS

The study was conducted at King George's Medical University, Lucknow. The institute is a 100-year old tertiary care 3500 bedded hospital with about 44 departments and catering to 510,000 OPD and 51,000 indoor patients per year. The study was conducted from March 2016 to August 2016. Ethical clearance was taken from the institutional ethical committee to conduct the study. It was a hospital based cross sectional study. Study participants included the doctors, staff nurses and laboratory technicians who were dealing with BMW. Data was collected using pre-designed, semi-structured questionnaire from study participants by interviewing them. The questionnaire included 7 questions on waste segregation practices; a score of 1 was given for correct practice and 0 for incorrect practice. A total score of ≤ 4 was considered as unsatisfactory practice and ≥ 5 was considered as satisfactory practice. Informed consent was taken from the health care workers after explaining them the purpose of the study. The study included details of various socio-demographic variables like age, sex, educational status, work experience and other details regarding practice of biomedical waste management. Total 314 healthcare personnel participated in the present study. It included 193 doctors, 85 staff nurses and 36 laboratory technicians. The data was compiled and analysed using SPSS Ver.21 software.

RESULTS

The biosocial characteristics of study participants are shown in Table 1. A total of 314 healthcare personnel were included in the study. Majority (70.7%) of the participants were in the age group of 26 to 35 years. Of the total 57.6% were female and most of them had an educational qualification of postgraduate (67.8%) and had a work experience of less than two years (65.3%). Among the participants 61.5% were doctors, 27.1% were staff nurses and 11.5% were laboratory technicians.

A total of 78% healthcare personnel had received training on BMW management, of which 76% were doctors, 17.1% staff nurses and 6.9% laboratory technicians. Most of the doctors (76.2%), staff nurses (70.6%) and laboratory technicians (72.2%) had received hepatitis vaccination. And as for injection TT 76.2% doctors, 85.9% staff nurses and 69.4% laboratory technicians had received it. Segregation of human anatomical waste into yellow bins was practiced by 88.6% doctors, 73% staff nurses and 50% of the laboratory technicians. Contaminated cotton/gauze were collected in yellow bin by more than half (55%) of the healthcare personnel. Majority (79.3%) of the participants segregated infected plastic wastes into red bin. Segregation of the general waste into black bins was followed by 95.2% of the participants. The collection of sharp wastes in puncture proof bins was practiced by 66% of the participants of which staff nurses (80%) practiced it the most. The practice of disposal of liquid waste after chemical treatment was poor, only 9.6% of the healthcare personnel practiced it. And majority of the healthcare personnel used hub cutter/electric burner to destroy the needle before discarding it (Table 2).

Table 1: Biosocial characteristics of study participants.

Bio-Social Characteristics		N	%
Age (years)	≤ 25	58	18.5
	26-35	222	70.7
	36-45	15	4.8
	≥ 46	19	6.1
Gender	Male	133	42.4
	Female	181	57.6
Educational Status	Postgraduate	213	67.8
	Graduate	51	16.2
	Intermediate	50	15.9
Occupational Status	Doctor	193	61.5
	Staff nurse	85	27.1
	Laboratory Technician	36	11.5
Work experience (years)	< 2	205	65.3
	3 - 5	78	24.8
	> 6	31	9.9

Table 3, shows the bivariate analysis to show association of waste segregation practices between various variables. Association between waste segregation practices and age, gender, occupation status, work experience and training was observed and it was statistically significant ($p<0.05$).

In Table 4, multivariate logistic analysis was done for those variables which showed p-value <0.05 in bivariate analysis. The waste segregation practices was found to be independently associated with occupational status and training received on BMW management which was statistically significant ($p<0.05$). The healthcare workers who received training are 5 times more likely to show correct practices of waste segregation as compared to those who did not receive training.

Table 2: BMW management practices among healthcare personnel at the tertiary hospital.

Practices	Doctors (n=193)	Staff Nurses (n=85)	Lab Technicians (n=36)	Total (n=314)
	N (%)	N (%)	N (%)	N (%)
BMW training received	186 (96.4)	42 (49.4)	17 (47.2)	245 (78)
Hepatitis-B vaccination	170 (88.1)	60 (70.6)	26 (72.2)	256 (81.5)
Injection TT	147 (76.2)	73 (85.9)	25 (69.4)	245 (78)
Correct method for collecting human anatomical waste	171 (88.6)	62 (73)	18 (50)	251 (80)
Correct method for collecting contaminated cotton/ gauze	107 (55.4)	52 (61.2)	14 (38.9)	173 (55)
Correct method for collecting infected plastic wastes	147 (76.2)	70 (82.3)	31 (86.1)	249 (79.3)
Correct method for collecting general wastes	187 (96.9)	81 (95.3)	31 (86.1)	299 (95.2)
Correct method for collecting sharp wastes	132 (68.4)	68 (80)	7 (19.4)	207 (66)
Correct method for discarding liquid waste	5 (2.6)	15 (17.6)	10 (27.8)	30 (9.6)
Correct method for discarding used needle	154 (79.8)	83 (97.6)	23 (63.9)	260 (82.8)

Table 3: Association between various variables and biomedical waste segregation practices.

Variables		No. of Respondents	Practice				P-value
			Satisfactory		Unsatisfactory		
			N	%	N	%	
Age (in years)	≤ 25	58	28	48.3	30	51.7	.039
	26-35	222	136	61.3	86	38.7	
	36-45	15	10	66.7	5	33.3	
	≥ 46	19	16	84.2	3	15.8	
Gender			Satisfactory		Unsatisfactory		P-value
			N	%	N	%	
	Male	133	67	50.4	66	49.6	.002
	Female	181	123	68	58	32	
Educational status			Satisfactory		Unsatisfactory		P-value
			N	%	N	%	
	Post graduate	213	131	61.5	82	38.5	.372
	Graduate	51	33	64.7	18	35.3	
	Intermediate	50	26	52	24	48	
Occupational status			Satisfactory		Unsatisfactory		P-value
			N	%	N	%	
	Doctors	193	119	61.7	74	38.3	.001
	Staff nurses	85	61	71.8	24	28.2	
	Lab Technician	36	10	27.8	26	72.2	
Work experience (in years)			Satisfactory		Unsatisfactory		P-value
			N	%	N	%	
	≤ 2	205	125	61	80	39	.018
	3 – 5	78	40	51.3	38	48.7	
	≥ 6	31	25	80.6	6	19.4	
Training on BMW management			Satisfactory		Unsatisfactory		P-value
			N	%	N	%	
	Yes	245	163	66.5	82	33.5	.001
	No	69	27	39.1	42	60.9	

Table 4: Multivariate logistic regression analysis of factors related with waste segregation practices.

Variables	P-value	AOR	95% CI	
			Lower	Upper
Age (in years)				
≤ 25	0.457	0.519	0.092	2.920
26-35	0.696	0.718	0.137	3.767
36-45	0.802	1.294	0.171	9.768
≥ 46	-	-	-	-
Gender				
Male	0.206	0.714	0.424	1.203
Female				
Occupational status				
Doctor	0.067	2.961	0.928	9.447
Staff nurse	0.001	9.804	3.053	31.483
Lab technician	-	-	-	-
Work experience				
≤ 2	0.271	0.466	0.119	1.816
3 - 5	0.115	0.343	0.090	1.300
> 6	-	-	-	-
Training on bmw management				
Yes	0.001	4.799	1.957	11.772
No	-	-	-	-

DISCUSSION

Almost all the doctors (96.4%) and half of the staff nurses (49.4%) and laboratory technicians (47.2%) had received training on biomedical waste management. Munda et al also found that 53.33% of healthcare personnel received the BMW training. Patil et al showed that altogether 50.3% HCW had undergone training regarding BMW management.[5,6] In this study the high percentage of training received among the doctors maybe because of the compulsory BMW training during joining into the institute. Majority of the participants had received Hepatitis B (81.5%) and injection Tetanus (78%) vaccination. Wicker S et al showed that number of HBV vaccinated HCWs average of vaccinated persons was 78.2%.[7] Kalia et al in their study showed that immunization status for tetanus and hepatitis B is satisfactory among nurses and laboratory technicians.[8]

In this study the waste segregation practices were more satisfactory among doctors and nurses than laboratory technicians. The practice of waste segregation was maximum among the staff nurses (71.8%) followed by doctors (61.7%) and laboratory technicians (27.8%). Similar findings were found in a study by Chawla et al which showed that 12 (80%) of doctors and 18 (69.2%) of staff nurses disposed off the biomedical waste in specified colour coded containers.[9] Correct practice of discarding general waste, human anatomical waste, infected plastic waste and used needle was more than 80%. Hakim et al found in their study that more nurses had satisfactory practice scores (84.0%) than did physicians (67.3%).[10]

In this study an association between occupational status and training received on BMW training was found. Similar findings were found in a study by Acharya et al which showed the association between different professional group and their awareness regarding definition, generation and classification, colour-coding and segregation of biomedical waste was found to be statistically highly significant.[11] Another study by Muluken et al showed that healthcare workers who took training on healthcare waste were 2.29 times more likely to practice healthcare waste management than their counter parts who didn't take training on healthcare waste management.[12] Sarker et al in their study showed that HCPs without prior training on MWM were more likely to have poor practices compared to those who had training.[13]

CONCLUSION

Majority of the healthcare personnel received training on healthcare waste management and had received hepatitis B and injection TT vaccination. Waste segregation practices were more satisfactory among staff nurses and doctors than laboratory technicians. Waste segregation practice was found to be independently associated with occupational status and training received on BMW management which was statistically significant. The importance of training regarding biomedical waste management cannot be overemphasized; training and retraining on healthcare waste management should be given to healthcare personnel and all healthcare personnel should be vaccinated against tetanus and Hepatitis-B.

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