

Awareness and practice of biomedical waste management among healthcare personnel: an experience of a teaching hospital of West Bengal

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ABSTRACT

Background: Medical services to masses are generally provided by hospitals in India. The bio-medical waste (BMW) generated in hospitals has the ability to transmit infections and other hazards to the health care personnel working at the point of its generation.

Aim: To find out the level of awareness and practices of bio-medical waste management amongst the health care providers working in a teaching hospital of West Bengal, India.

Methods: The present descriptive study using cross sectional design was carried out in a teaching hospital of West Bengal from June to August 2012. The study was carried out in 3 groups namely doctors, nurses and paramedical staff members with the help of a pre-designed, pre-tested, semi-structured questionnaire. The study population finally had 30 doctors, 34 nurses and 33 paramedical staff of the hospital. Data were analysed with statistical software using proportion and chi square test.

Results: Doctors were most aware about the biomedical waste management followed by nurses and paramedical staff. Segregation was carried out adequately in most of the departments whereas pre-treatment with hypochlorite was carried out only in microbiology and pathology laboratories. Young age, male doctors and work experience of less than 20 years were significantly associated with more awareness about the BMW management.

Conclusion: The awareness about the importance of bio-medical waste management is still poor amongst the nurses and para-medical staff working in a teaching hospital of West Bengal.

Key Words: bio-medical waste, health care personnel, segregation, pre- treatment, guideline

INTRODUCTION

Biomedical waste (BMW) is the waste generated during diagnosis, treatment or immunization of human beings or animals, or in research activities, or in the production and testing of biological, and is contaminated with human fluids.¹ Hospital wastes are potentially hazardous. Though 75-80% of wastes generated from hospitals are non-infectious, 20-25% is hazardous.² Hospital waste includes hazardous or risk waste and non-risk waste. Infectious waste includes pathological waste, sharps, pharmaceutical waste, genotoxic waste, chemical waste and radiological waste. The non-risk waste comprises of food stuff leftovers, cardboards, packages etc.³ Hospital waste management means the management of waste produced by hospitals using techniques

that will check the spread of diseases.⁴ All individuals exposed to hazardous waste are at potential risk more so who belong to medical profession, patients and visitors to the hospital. The major diseases transmitted through BMW are Hepatitis B, Hepatitis C, and Acquired Immunodeficiency Syndrome (AIDS).⁵ Government of India has outlined specifications for hospital waste management under Environment (Protection) Act Biomedical Waste (Management and Handling) Rules 1998. This rule applies to all related to generation, collection, transport, treatment and disposal of BMW. Waste should be segregated and removed from hospitals in a proper manner so that no harm occur to anyone directly or indirectly.⁶ However, the BMW management is not getting much attention and is thus

becoming a major problem in hospitals.⁷ Keeping in view the poor status of BMW management in Indian hospitals, this study was carried out to assess the awareness and the practices on BMW waste management among health care professionals of a teaching hospital of West Bengal.

MATERIALS AND METHODS

A cross-sectional, descriptive epidemiological survey was conducted in seven wards (Medicine, Surgery, Gynaecology & Obstetrics, Orthopaedics, Paediatrics, Ophthalmology and ENT), 2 Operation theatres, Emergency ward, three Laboratories (Biochemistry, Pathology and Microbiology) of the teaching hospital. Data was collected for a period of 3 months (June to August'2012). Practice aspect was observed in emergency ward and OTs. A study done by Bansal M et al⁸ in the rural health facilities of Gwalior district showed that, the correct response to the question of awareness regarding about 10 - 25% of total waste generated in a hospital is hazardous among the doctors was 32.75%. By taking that percentage as the prevalence, with an allowable error of 10% the calculated sample size for the study was 88. By adding non response rate of 10%, the final sample size turned out to be 97. The study was carried out in 3 groups of health care professionals namely doctors, nurses and paramedics or non-medical staffs. It was decided to take at least 30 respondents from each group. The study population (N = 97) at the end of study finally had 30 doctors, 34 nurses, 33 paramedical staff of the hospital. A pre-designed, pre-tested, semi-structured questionnaire was used to observe the response on awareness and existing practices in

bio-medical waste management. The proforma had three parts. First part dealt with socio-demographic variables profiles of the respondents, second part on awareness and third part regarding the existing practices of various steps involved in the bio-medical waste management. Maintaining strict confidentiality and after getting informed verbal consent, the respondents were interviewed in their local language. The respondents who were working at their current position for at least 6 months were included in the study. In this study, for segregation and transportation aspect, two terms were used namely adequate and inadequate. For these two terms, references were used as per do's and don'ts mentioned in Infection Management and Environment Plan (IMEP).⁹ Regarding segregation and transportation, we marked adequate if Do's and don'ts were followed in the respective departments during observing the practice part of the study.

Awareness aspect was scored after giving score 1 for right responses and score 0 to wrong or don't know responses. Scoring was done only for the questions asked on awareness aspect. At the end of study, it is seen that the minimum and maximum score obtained by one is 7 and 28 respectively. The awareness scale was divided into 4 categories: score between 7 – 12 was given poor score, between 13 – 18 was average score, 19 – 24 was good score and more than 24 was very good score. Data were analysed with the help of SPSS 16.0 software using simple proportions and percentages. The association between awareness score and socio demographic variables was found out by chi square test. p value of less than .05 was considered significant.

RESULTS

The mean age (SD) of participants was 40.06 (10.63) years. Female respondents were more in proportions than male ones with a ratio of 3:2. Indoor wards had 81.4% respondents. Mean (SD) years of service was 13.16 (11.54) years (table1).

Table 1: Socio-demographic profile of the respondents (N = 97)

Variables	Number (%)	Statistics	
Age Group (yrs.)			
21 – 30	20 (20.6)	Mean +/- SD = 40.06 +/- 10.63 yrs. Range = 23 – 69 yrs.	
31 – 40	38 (39.2)		
41 – 50	18 (18.6)		
>50	21 (21.6)		
Sex			
Male	39 (40.2)		
Female	58 (59.8)		
Department			
Indoor wards	79(81.4)		
Laboratory	18 (18.6)		
Present Posts			
Head/ Assoc. professor	5 (5.2)		
Assistant Professor/ demonstrator/RMO cum clinical tutor	18 (18.6)		
Junior/ Senior Residents	7 (7.2)		
Technicians	9 (9.3)		
Nurses	34 (35.0)		
GDA / Sweeper/ Aya	24 (24.8)		
Years of Service			
1 – 10	50 (51.5)		Mean +/- SD = 13.16 +/- 11.54 yrs. Range = 1 – 37 yrs.
11 – 20	15 (15.5)		
21 – 30	17 (17.1)		
>30	11 (11.3)		
Not available	4 (4.1)		

Only 21.65% were aware that 10-25% of BMW is hazardous and 75-90% is non-hazardous. All were aware of need for segregation, but only nine knew the correct site of segregation was at source. 30.9% favored use of gloves, masks, plastic aprons altogether as protective measures. All participants were aware that colour coded plastic bags are needed to collect waste while 59.8% were aware about all 4 color bags. 94 health care personnel were aware of need of transportation for terminal disposal while 86.5% knew that pre-treatment was required prior to disposal. Red bag considered as the major mode of collection for category 1,3,6,7 and black bag for category 5, 8, 9, 10. For category 4, blue bag was considered as major

method of collection by 57.7% respondents. Incineration was chosen as the major disposal method for most of the categories of BMW (table 2).

Table 2: Assessment of awareness according to categories of BMW

Category of BMW	Considered Hazardous (%)	Method of collection in color coded bag		Method of disposal (%)	
		Major (%)	Don't know (%)	Major (%)	Don't know (%)
Human tissues, body parts, organs etc.	93 (95.9)	Red bag (52.6)	10.3	Deep burial (21.6)	66.0
Animal tissue, organs, blood, body fluid etc.	42 (43.3)	Yellow bag (10.3)	77.3	Incineration (6.2)	87.6
Wastes from laboratory, vaccines, petridishes etc.	80 (82.5)	Red bag (18.6)	73.2	Incineration (4.1)	90.7
Needles, syringes, scalpels, blades etc.	96 (99.0)	Blue bag (57.7)	14.4	Boiling (7.2)	16.5
Discarded medicines	19(19.6)	Black bag (18.6)	70.1	Incineration(4.1)	86.6
Cotton, dressings etc.	90 (92.8)	Red bag (55.7)	23.7	Incineration(9.3)	75.3
I/V set, tubes, catheters etc.	78 (80.4)	Red bag (34.0)	32.0	Incineration (5.0)	63.9
Waste of washing, disinfecting activities.	63 (64.9)	Black bag (12.4)	81.4	Incineration (6.2)	89.7
Incineration ash	21 (21.6)	Black bag (9.3)	87.6	Deep burial (4.1)	89.7
Insecticides, disinfectants	46 (47.4)	Black bag (12.4)	78.4	Deep burial (2.1)	92.8

Red bag and black bag were used for collection of category 5, 6, 7 in the wards at the time of practice while blue bag was used in laboratory for category 1, 4 and 6. Black bag was used in OT for category 5, 6, 7 and blue one for category 4. Table 3 showed that segregation was carried out adequately as per IMEP guidelines in the departments of surgery, orthopaedics, ophthalmology, emergency, microbiology and biochemistry laboratory.

Table 3: Department wise practice of BMW handling

Department	Segregation adequate	Pre-treatment done	Storage at production site <=1time/day	Frequency of removal ---	Transportation adequate
Medicine	No	No	Yes	No	Yes
Surgery	Yes	No	Yes	No	Yes
G & O Ward	No	No	Yes	No	Yes
Orthopaedics	Yes	No	Yes	No	Yes
Paediatrics	No	No	Yes	Yes	Yes
Ophthal	Yes	No	Yes	No	Yes
ENT	Yes	No	Yes	No	Yes
Emergency	Yes	No	Yes	Yes	Yes
OT	No	No	Yes	No	Yes
Microbiology lab.	Yes	Yes (hypochlorite)	Yes	Yes	Yes
Pathology Lab	No	Yes (hypochlorite)	Yes	Yes	Yes
Biochemistry/ central Lab	Yes	No	Yes	No	Yes

Pre-treatment of BMW with hypochlorite was carried out only in laboratories associated microbiology and pathology departments. Storage at production site less than 1 time per day was seen everywhere whereas frequency of removal more than once per day was observed only in emergency and two laboratories. Among 30 doctors, 18 got good or very good score, whereas none of the nurses got good score while 3 out of 33 paramedics got either good or very good scores on awareness. Table 4 depicts that there was significant difference in the awareness score among the age group, sex, different cadre of health personnel, and also between the personnel having service of more and less than 20 years. In this study, it was seen that younger doctors had better knowledge.

Table 4: Relationship between awareness about BMW and selected socio demographic variables

Variables	Awareness score		Statistics
	Poor/average	Good/very good	
Age group (yrs.)			
<=40	42	16	$\chi^2 = 4.66, df=1$ P = 0.03
>40	36	3	
Sex			
Male	22	17	$\chi^2 = 16.40,$ P = 0.000
Female	54	4	
Department			
Indoor wards	43	12	$\chi^2 = 3.79, df=2$ P = 0.15
Emergency/ OT	21	2	
Laboratory	12	6	
Present posts held			
Doctors	12	18	$\chi^2 =$ 38.48, df=2 P = 0.000
Nurses	34	0	
Paramedical workers	30	3	
Years of service			
<=20	48	17	$\chi^2 = 5.02, df=1$ P = 0.02
>20	27	1	

DISCUSSION

In our study we found out that males has better knowledge about the BMW but the sex may be a confounding factor as almost all nurses in the study are females and nurses overall has poor knowledge about the BMW. The fact that the awareness about BMW is maximum amongst doctors, followed by nurses and least amongst

para-medical workers was corroborated by a similar study done in different hospitals of Madhya Pradesh, another large state of India.⁸

The present study showed that the awareness on collection of BMW by colour coded plastic bag in health personnel is cent percent. Ninety seven were aware that the handling of BMW carries risk of transmitting diseases and similar proportion were aware of the need of terminal disposal of BMW. Segregation of BMW at source is of utmost importance. In our study few practice segregation at source. This seems to be a problem of any developing nation as a study done in neighbouring Pakistan shows that only 25% of the surveyed hospitals were segregating the BMW at source.^{10,11}

Our finding of more than half (54%) of the respondents were aware of any law related to BMW management is a cause of concern as around 80% of the respondents in Ludhiana were aware of the BMW management rules.¹²

CONCLUSION

Present study pointed out a gap in the awareness level on BMW management. Thus we recommend for awareness campaign along with supervision and monitoring at regular interval for the improvement on every aspect of BMW management.

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REFERENCES

1. Das SK, Sushant P, Jayaram K. A TQM approach to implementation of handling and management of hospital waste in Tata Main Hospital : Issued by hospital Waste Management Committee, T.M/H. 2001;11-12(1-2):75-78
2. Pruss A, Circouit E, Rushbrook P.Safe management of waste from health care activities;WHO1999; p2
3. Hashmi SK, Shabab S. Hospital and biomedical waste management ,4th edition 2003; pp.426-37
4. Mahmood M, Shabab S , Malik R, Azim. A study of waste generation , collection and disposal in a tertiary hospital. Pak J Med Res. 2001;40:13-17.
5. Ahmed S. Hospital waste sickening public and environment. Dially Times , 8th July 2004,p.7
6. The bio-medical waste (management & handling) Rules, Ministry of Environment & Forest, Government of India,1998.
7. Da Silva CE, Hoppe AE, Ravanello MM, Mello N. Medical wastes management in the south of Brazil. Waste Manag. 2005;25(6):600-5.
8. Bansal, Manoj, Ashok Mishra, Praveen Gautam, Richa Changulani, Dhiraj Srivastava, and N. Gour. "Biomedical waste management: awareness and practices in a district of Madhya Pradesh." Natl J Commun Med 2, no. 3 (2011): 452-6.
9. Infection management and environment plan.Guidelines for healthcare workers for waste management and infection control in primary health centres: Ministry of health and family welfare, Govt. of India.pp.18-22.
10. Rasheed S, Iqbal S, Baig LA, Mufti K. Hospital waste management in the teaching hospitals of Karachi. J Pak Med Assoc. 2005 May;55(5):192-5.
11. Ngwuluka, N., Ochekepe, N., Odumosu, P., & John, S. A. (2009). Waste management in healthcare establishments within Jos Metropolis, Nigeria. African Journal of Environmental Science and Technology, 3(12).
12. Mathew, S. S., Benjamin, A. I., & Sengupta, P. (2011). Assessment of biomedical waste management practices in a tertiary care teaching hospital in Ludhiana. Healthline, 2(2), 28-30.