Awareness Of Healthcare Workers Regarding Biomedical Waste Management (BMW) At Tertiary Care Government Hospital In Dhule (Maharashtra).

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Abstract : Background and objectives: Biomedical waste has been a growing concern due to increased awareness in public regarding HIV/AIDS, hepatitis B and exposure to other potential infectious diseases. Good BMW disposal practices lead to reduction in medical expenditure, unsightly scenes at various disposal bins and dumping sites. Improper biomedical waste management practices and indiscriminate disposal of hospital waste causes spread of illness leading to financial burden to society. The money saved by reduction in hospital acquired infections is much more than spent on control of hospital acquired infections. Therefore it is necessary to educate the staff, patients and community about the management of the infectious waste. The present study was designed to assess the awareness regarding biomedical waste in health care workers at a tertiary care Government hospital, Dhule (Maharashtra). Methods: Shri Bhausaheb Hire Government Medical College and Hospital is a 545 bedded tertiary care teaching Government hospital situated in rural area of Maharashtra at Dhule where per day approximately 90 Kg biomedical waste is generated .The present cross-sectional study was conducted during 1st August 2011 to 30th September 2011. Knowledge and practices about BMW was assessed among 153 health care workers (81 nursing staff, 35 laboratory technicians and 37 sweepers) handling BMW in the tertiary care Government hospital at Dhule. Results: It was found that only 70.6% of the health care workers were aware of biomedical waste management and 50.3 % had undergone training. 72.5 % of the health care workers were aware of 3 color coded bags used for collection of BMW. In the study only 41.8% of the workers were vaccinated against shepatitis B and 81.7% had received tetanus toxoid vaccine. Conclusion: For proper handling and disposal of BMW, all health care providers must undergo regular training in BMW management. [Patil S et al NJIRM 2013; 4(4) : 74-79]

Key Words: Health care workers (HCW), Biomedical waste (BMW), Training programs, and color coded bags.

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Introduction : Biomedical waste (BMW) means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological, and including categories mentioned in Schedule I of BMW Rules of 1998[1]. The greatest risk of BMW is from the infectious and sharp components because health care workers (HCW) and people associated with handling waste are often getting needle prick injuries[2] and can contract infections like HIV/AIDS, Hepatitis B and C. It is estimated that 10%-25% of health care waste is hazardous[3] with the potential for creating a variety of health problems.

Persons at risk of exposure include health care facility employees (doctors, nurses, health care assistants, maintenance personnel and support personnel for waste handling, transportation and laundry), patients and their visitors, and waste management facility employees and scavengers. Infectious wastes containing potentially harmful micro-organisms can infect hospital patients, health care employees, and patient's visitors[4]. Improper biomedical waste management practices and indiscriminate disposal of hospital waste causes spread of illness leading to financial burden to society. Good BMW disposal practices lead to reduction in medical expenditure, unsightly scenes at various disposal bins and dumping sites ultimately leading to healthier society. Therefore, it is necessary to educate the staff, patients and community about the management of the infectious waste.

In our country, per day approximately 90 to 100 Kg of biomedical waste is generated as per the Bio-Medical rules in the hospital establishment[5]. So it is the duty of every hospital to ensure safe handling and management of biomedical waste. As per the BMW rules, it is the duty of every BMW

generator to dispose of BMW safely. Hence it is important that, all health care workers should be well versed with the procedures to be followed in their institutions as well as the rules set by the Government for hospital waste management under the "Biomedical Waste" (Management & Handling) Rules, 1998"as amended in June 2000[6].The key to minimization and effective management of biomedical waste is segregation and identification of the waste. Biomedical waste should be segregated into color coded plastic bags or containers at the point of generation in accordance with Schedule II of Biomedical Waste (management and handling) Rules 1998.

Money saved in management of hospital acquired infections is much more than that spent on treating those infections and spent on its control activities. The present study was conducted with the following objectives that to assess the knowledge of HCW regarding bio-medical waste and its management and to assess the existing practices of biomedical waste management within the institution.

Material & Methods: Shri Bhausaheb Hire Government medical College and Hospital is a 545 bedded tertiary care teaching Government hospital situated in rural area of Maharashtra at Dhule. The hospital has work force of total 302 health care workers in which 156 are nurses, 45 are technicians and 101 are sanitation workers. The Sanitation workers include 18 laboratory attendants and 83 sweepers performing job of waste collection and transportation. For biomedical waste management, hospital is having its own incineration plant where one incinerator, one autoclave and one shredder machine is operating since year 2000.

The present cross-sectional study was conducted during 1st August 2011 to 30th September 2011. The study was approved by institutional ethical committee. Knowledge regarding BMW management amongst nursing staff, Paramedical Staff and Sweepers was assessed. Of those willing to participate were directly interviewed with predefined, pre-structured questionnaire. Total 302 Health care workers were in position, out of which 153 (50.7%) participated and responded to questionnaires. The questionnaire consisted of information regarding knowledge and hazards of BMW, segregation practices, color coding, needle cutter, vaccination status and preventive safety measures of health care workers. Before administering the questionnaire, the purpose of the study was explained to all participating health care workers. The results were obtained by analyzing the data with SPSS software version 16.

Results: Out of 153 health care workers, 52.9% (81) were nurses, 22.9 % (35) were laboratory technicians and 24.2 % (37) were sanitary workers. Data Obtained in our study reveals that maximum i.e. 40.5 % (62) health care workers were in the age group of 30 to 40 years and 26.8% (41) were within 41 to 50 years age. There were 20.3 % (31) health care workers within 20 to 30 years and 12.4 % (19) were more than 50 years of age (Table No 1). Female health care workers were 58.8% (90) and 41.2% (63) were males of those participated in the study.

Table 1: Age group wise distribution of HCW.

Age Group	Frequency	Percent
<30 years	31	20.3
31 - 40 years	62	40.5
41 - 50 years	41	26.8
>50 years	19	12.4
Total	153	100.0

Though BMW management is very crucial for health care providers it was found that only 70.6 % (108) HCW heard about BMW. Out of total participants , 8.6% (7) nurses, 37.1% (13) laboratory technicians and 67.6% (25) sanitary workers had not heard and were not aware of BMW and hazards of improper management.

Altogether 50.3% (77) HCW had undergone training regarding BMW management. 60.5 % (49) nurses, 45.7% (16) laboratory technicians and 32.4% (12) sanitary workers were trained for BMW management (Table No 2).

Table 2 : **Showing awareness regarding biomedical waste and its management among health care workers.**

Awareness of Biomedical waste Management		Occupation			Total (n=153)
		Nurse (n=81)	Laboratory Technician (n=35)	Sanitary workers (n=37)	
Heard about BMW		74 (91.4%)	22 (62.9%)	12 (32.4%)	108 (70.6%)
Undergone Training of BMW management		49 (60.5%)	16 (45.7%)	12 (32.4%)	77 (50.3%)
Knowledge regarding the correct Number of Colour Bags to be provided for BMW collection		68 (84%)	24 (68.6%)	19 (51.4%)	111 (72.5%)
Type of waste in Black bag	General waste	37 (45.7%)	24 (68.6%)	13 (35.1%)	74 (48.4%)
	Other type or Don't Know	44 (54.3%)	11 (31.4%)	24 (64.9%)	79 (51.6%)
Type of waste in Red bag	Infectious contaminated with body fluid/blood	38 (46.9%)	17 (48.6%)	11 (29.7%)	66 (43.1%)
	Other type of BMW or Don't Know	43 (53.1%)	18 (51.4%)	26 (70.3%)	87 (56.9%)
Type of waste in Yellow bag	Body Parts	30 (37%)	12 (34.3%)	13 (35.2%)	55 (35.9%)
	Other type of BMW or Don't Know	51 (63%)	23 (65.7%)	24 (64.8%)	98 (64.1%)
Type of waste collected in Blue / white container	Sharps	65 (80.2%)	15 (42.8%)	7 (18.9%)	87 (56.8%)
	Other type of BMW or Don't Know	16 (19.8%)	20 (57.2%)	30(81.1%)	66 (43.2%)

The knowledge regarding the correct number of bags to be provided for waste collection was present among 72.5 % (111) respondents. From Table No 2, it was found that maximum Sanitary workers i.e. 48.6% (18) and 31.4% (11) laboratory technicians had incorrect knowledge of the number of color bags provided for BMW management in the institute.

It was found that 48.4% (74) health care workers had correct knowledge of collection of the general waste in Black bag. Poor knowledge of category and type of waste to be collected in black bag was noted in 64.9 %(24) sanitary workers and 54.3 % (44) nurses. (Table No 2)

Of the participants, 43.1 %(66) health care workers correctly told of collection of infectious material in red bag. Maximum technicians 48.6% (17) and 46.9%(38) nurses while only 29.7 %(11) sanitary workers had the correct knowledge about type of waste to be collected in Red bag. (Table No 2)

It was found that only 35.9 %(55) respondents had correct knowledge of collection of body parts in yellow bag. About 63% to 66% of the respondent in either of the three groups, didn't know or had wrong knowledge about type of waste to be collected in yellow bag.

56.8%(87) HCW responded correctly about collection of sharps in blue / white container. Maximum number of nurses 80.2% (65) and minimum sanitary workers 18.9% (7) and 42.8 % (15) technicians correctly had the knowledge of blue or white container.

Table 3 : History of Hepatitis B and Tetanus toxoid vaccination in health care workers.

Immunization	Occupation			Total (n=153)
	Nurse (n=81)	Laboratory Technician (n=35)	Sanitary workers (n=37)	
Hepatitis B Vaccination	41 (50.6%)	19 (54.3%)	4 (10.8%)	64 (41.8%)
Tetanus toxoid Vaccination	64 (79%)	32 (91.4%)	29 (78.4%)	125 (81.7%)

Out of 153 participants, 41.8% (64) and 81.7% (125) were immunized for hepatitis B and tetanus respectively. It was derived that 49.4% (40) nurses and 45.7% (16) laboratory technicians while 89.2% (33) sanitary workers had no vaccination of Hepatitis B (Table No 3). Safety measures were adequately supplied according to 89.5%(137) health care workers (Table No 4). Of the participated HCW 88.9% (72) nurses, 97.1% (34) technicians and 83.8% (31) sanitary workers were satisfied with the provision of safety measures to them.

Table 4 : Safety measures practised by Health care workers.

Practices		**Occupation**			
		Nurse (n=81)	Lab Technician (n=35)	Sanitary workers (n=37)	Total (n=153)
Safety measures	Yes	72 (88.9%)	34 (97.1%)	31 (83.8%)	137 (89.5%)
	No	9 (11.1%)	1 (2.9%)	6 (16.2%)	16 (10.5%)

Discussion: Health care workers are the key workers in the management of biomedical waste generated time to time in the hospital setup. The inadequate knowledge of this crucial work force is dangerous for their own health and those in the society. The present study assessed the awareness of BMW management in technically qualified paramedical staff i.e. nurses and laboratory technicians and non medical staff such as waste handlers i.e. sweepers and laboratory attendants. Though the awareness of BMW is very important to hospital staff but it was noted that maximum of sanitary workers and most of the technicians had not heard about the BMW terminology.

Identification & segregation of the hazardous waste from nonhazardous i.e., from the general domestic waste is important aspect of BMW management. To make the demarcation and for proper segregation, the color coding system is implemented according to the category of waste collected in the specific colored bags. Though Shri Bhausaheb Hire Government Medical College and hospital has provided 3 different color bags for BMW collection, most of the laboratory technicians and maximum sanitary workers did not know about it.

More than 50% of the health care workers had no knowledge about the type of waste to be collected in black, red or yellow colored bags. The knowledge about waste type to be collected in the particular bag was least within sanitary workers than laboratory technicians and nurses. These findings are similar to the studies done by various researchers.

Deo et al[7] have found that though maximum paramedical workers were aware about BMW, only 27.44% paramedical, 11.29% nonmedical staff knew the exact details of segregation of BMW . In study by Shalini S[8], the awareness of risk involved in biomedical waste handling was found only in 42.59% waste handlers / sweepers.

Similarly Knowledge status regarding composition of hospital waste was found to be poor in Para-medical and non-medical workers by Bansal and his colleagues[9].

Thus, our study revealed that the awareness and proper practice of BMW was not satisfactory which is in contrary to the study by Yadavannavar [6]. Our study showed that the majority of nursing staff and technicians were aware while sanitary workers

were not aware about the measures for safe collection and final disposal of BMW. Similar findings to our study were observed by Rao[5].

Pandit NB *et* al[10] reported that proper hospital waste management was not being practiced and this supported our findings. It is important for all the employees in the health care facility irrespective of their position and type of work to ensure proper collection, segregation, and transport of BMW. Similar observation was made by Yadavannavar[6] that the newer employees are being oriented regarding proper collection and transport of hospital waste.

Saraf et al[11] noted in awareness study about hospital waste management that doctors & nurses had good knowledge of waste management as compared to workers.

It was found that very few Paramedical workers had knowledge about hazards involved in handling of biomedical waste. This may be because of their low level of education. Similar observations were noted by Deo et al[7], Sharma S [8] and Pandit NB et al[10] that waste segregating practices were not adequate and mixing of different categories of waste was found.

The average score about general information, practical knowledge of biomedical waste was least in non medical staff[7]. The BMW management practices in the hospital were satisfactory, except for a deficiency in supply of needle-cutters in 40.9% wards[12].

According to World Health Organization report 85% of hospital waste is non hazardous waste[2]. The same was true about knowledge regarding proper treatment and disposal of biomedical waste with 22.53% paramedical, 12.15% medical and 4.80% nonmedical staff having exact knowledge.

KAP study in Kathmandu valley reflects that existing BMW management practices are not satisfactory[13].

Ward attendants - did not know about the risks associated with hospital waste[10]. Our study revealed that there is lack of knowledge about waste management among the waste handlers. It affects the safe practices for management. So this subordinate staff, who actually handles the waste, is at higher risk and need to be educated.

Knowledge about the practical aspects of BMW management was better in nurses and paramedical staff [12] and regarding composition of hospital waste was poor in Para-medical and non-medical workers[9].

Knowledge about hazards and prevention of hazards of BMW management and handling was least among non-medical workers. Hence, awareness of correct management of BMW is essential in health care workers.

In this study, the knowledge about color coding and segregation was more among Para-medical than non medical workers. These findings were supported by studies done by various researchers[8,10]. The study conducted in urban/rural areas of 3 states in India in 2008[14] and in Surat Municipal Corporation[15] concluded that segregation and use of color codes revealed gaps which need correction.

Our study indicates that there is need of proper training and guidelines for the safety of patients, hospital staff and laboratory workers environment. Knowledge about color coding of containers, and waste segregation which is crucial for BMW management, was also found better among the technically qualified staff as compared to that of the sanitary staff. Low level of knowledge is mainly attributed to poor training facilities and low educational level of the sanitary staff. Frequent training of both the technical staff and the nontechnical staff is critical for the proper and appropriate management of biomedical waste.

Conclusion: Awareness about Biomedical waste is crucial component for its management while lack of awareness of health care workers causes greater impact on its management. It is concluded

that the awareness regarding BMW management is unsatisfactory in paramedical and non-medical workers. As these workers are regularly engaged in the process of BMW management and handling, therefore there is an urgent need for orientation training about BMW management. There should be compulsory and continuous training for healthcare personnel. The proper and comprehensive training of sanitary staff is specially emphasized.

References:

1. Government of India. Bio-Medical Waste (Management and Handling) Rules, 1998, Extraordinary, Part II, Section 3, Subsection (ii), The Gazette of India, 27th July 1998, No- 460.
2. Kishore J, Goal P, Sagar B, Joshi TK. Awareness about Biomedical Waste Management and Infection Control among Dentists of a Teaching Hospital in New Delhi, India. Indian J Dent Res 2000; 11(4):157-61.
3. Biomedical Waste Management – Self Learning Document for Doctors, Superintendents & Administrators. Manual, Enviornment Protection Training & Research Institute, Andra Pradesh, Pg 15, www.eptri.com.
4. Bekir Onursal. Health care waste management in India. Lessons from experience. Oct 2003.Chapter 1;1-2.
5. Rao H.V.N., Disposal of Hospital wastes in Banglore and their impact on Environment, Appropriate Waste Management Technologies for developing countries, 3rd International conference 25-26 Feb 1995, Nagpur, Technical paper Vol II.
6. MC Yadavannavar, Aditya S Berad, and PB Jagirdar. Biomedical Waste Management: A Study of Knowledge, Attitude, and Practices in a Tertiary Health Care Institution in Bijapur. Indian Journal of Community Medicine. 2010 Jan; 35(1)170-171.
7. Deo D, Tak SB & Munde SS. A study of Knowledge Regarding Biomedical Waste Management among Employees of a Teaching Hospital in Rural Area. J of ISHWM. April 2006;(1):p.12-16.
8. Shalini Sharma, Awareness about Bio-Medical Waste Management among Health Care Personnel of Some Important Medical Centers in Agra. Internsational Journal of Environmental Science and Development, Vol. 1, No. 3, August 2010; 251-255 .
9. Bansal Manoj, Ashok Mishra, Praveen Gautam, Richa Changulani, Dhiraj Srivastava, Neeraj, Singh Gour. Biomedical waste management: awareness and practices in a district of madhya pradesh. National Journal of Community Medicine 2011;Vol 2 (3),452-456.
10. Pandit NB, Mehta HK, Kartha GP, Choudhary SK. Management of bio-medical waste: Awareness and practices in a district of Gujarat. Indian J Public Health 2005;49:245-7.
11. Saraf Y., M. Shinde, S.C. Tiwari. Study of Awareness Status about Hospital Waste Management among Personnel and Quantification.Indian Journal of Community Medicine Vol. 31, No. 2, April - June, 2006;111.
12. Mathew S S, Benjamin A. I., Sengupta Paramita. Assessment of biomedical waste management practices in a tertiary care teaching hospital in Ludhiana H e a l t h l i n e Volume 2 Issue 2 July-December 2011. ISSN 2229-337.
13. Kedar R, Deshpende A. Critical evaluation of Biomedical Waste Management practices in Kathmandu valley. Chennai, India: Proceedings of the International Conference on Sustainable Solid Waste Management, 2007. p. 142-7.
14. Rao PH. Report: Hospital waste management--awareness and practices: A study of three states in India. Waste Manage Res 2008; 26:297-303.
15. Naik Ashish, Modi Bhautik, Bansal RK . Bio-Medical Waste Handling Practices In Urban Health Centres Of Surat Municipal Corporation. National Journal of Community Medicine Vol 3 Issue 1 Jan-March 2012,. 164-167.

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