

## **Knowledge, Attitude and Practice of Biomedical waste management among health care personnel in a tertiary care hospital in Puducherry**

**Malini A<sup>\*</sup>** and Bala Eshwar

*Department of Microbiology, Indira Gandhi medical College (Govt of Puducherry Institute), Puducherry*

### **\*Correspondence Info:**

Dr. Malini A,  
Associate Professor,  
Department of Microbiology,  
Indira Gandhi Medical College & Research Institute  
(Govt of Puducherry Institute), Puducherry  
E-mail: [drmalinirb@yahoo.co.in](mailto:drmalinirb@yahoo.co.in)

### **Abstract**

**Background:** Studies in India and other developing countries has shown lack of knowledge and poor practice of Biomedical waste management (BMW). Hence this study was undertaken to know the KAP of BMW in our hospital, to identify the gaps and to take necessary steps for rectification.

**Materials & Methods:** This was an observational descriptive hospital based cross sectional study. The study group included the 337 healthcare personnel which included doctors (residents), nurses, laboratory technicians and multi-purpose workers. The study was done using a pre-tested semi-structured questionnaire. The data was analysed using software SPSS 20 version. Proportions were used for interpretation.

**Results:** It showed that <50% of nursing staff and <25% of MPWs had the knowledge of colour coding and segregation. There was also poor knowledge regarding disposal of sharps among technicians and MPWs. It also brought to our notice that only 50% of the doctors (residents) and nursing staff and 26% of the laboratory technicians have undergone training in BMW management. None of the MPWs had received training regarding BMW management. They had good knowledge regarding the diseases transmitted through improper bio medical waste handling.

**Conclusion:** This study revealed that there is the need to continue the training programme for BMW and to include technicians and MPWs in the programme. It also shows that the administration needs to put protocols, provide PPE and other resources for better compliance of BMW rules.

**Keywords:** KAP, Bio-medical waste, health care workers

### **1.Introduction**

Bio Medical Waste 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 biologicals.[1]

It is the duty of every person working in a health care institution to take all steps to ensure segregation, safe handling & disposal of bio-medical waste (BMW), without causing any adverse effect to human health and the environment.[1]

It is estimated that 10-25% of the healthcare waste generated is hazardous & causes

serious health problems.[2] The waste generated in the hospital has significant health impact not only on the healthcare workers but also on the general public. Improper handling of waste not only poses significant risk of infection due to pathogens like HIV, Hepatitis B & C virus but also carries the risk of water, air & soil pollution thereby adversely affecting the environment and community at large.[3][4]

BMW management is currently a burning issue more so with the increasing health care facilities and increasing waste generation.[5] Therefore knowledge regarding the segregation &

disposal of BMW is essential for the health care workers(HCW).

Government of India has notified the Biomedical Waste (Management and Handling) rules 1998 with subsequent amendments (June 2nd 2000, September 2003 and 2011). India generates around three million tonnes of medical wastes every year and the amount is expected to grow at eight per cent annually.[5] Increasing population and increasing health awareness has led to increase in the number of health care facilities and increased generation of health care waste.[6] The purpose of BMW is mainly to reduce waste generation, to ensure its efficient collection, handling, as well as safe disposal. Lack of awareness and inadequate knowledge has led to the hospitals becoming the hub for spreading illness.

Our hospital is a tertiary care centre functional since four years where the protocols & policies are in a budding stage and yet to be put in place. Hence this study was undertaken with the objective to assess the knowledge regarding the BMW, to identify gaps in the practice of effective BMW management by the healthcare workers in our hospital, so that training of the HCW can be planned and necessary steps can be taken to put protocols in place.

## 2. Materials and methods

This study was an observational descriptive hospital based cross sectional study, among health care workers in different category. The hospital is a government hospital in Puducherry, a 750 bedded tertiary care centre. The study was done for a period of two months June & July 2014.

The study group included the healthcare workers who were grouped into four strata/subgroups as doctors(residents), nursing staff, laboratory technicians and multipurpose workers (class IV employees).All the HCW working in the institution for >6 months were included in the study and those who were not willing to participate in the study were excluded. The study population included 90 doctors (residents), 155 nursing staff, 25 laboratory technicians and 100 multipurpose workers (MPWs). Stratified random sampling method was used and the criterion was to use a minimum of 50% of the staff in each strata for the study. The study was done by using a pre tested, semi-structured questionnaire. Informed consent was obtained from the study participants and ethical clearance was obtained from the institute ethics committee. The data was coded and double checked into a work sheet on Microsoft excel 2013. Data compilation and analysis was done

using software SPSS 20 version. Proportions and percentage were used to interpret the result.

## 3. Observations and Results

The study was conducted in two months June & July 2014. A total of 63 doctors, 154 nurses, 23 laboratory technicians and 97 MPWs(n=337 ) took part in the study , which represented >50% in each strata/sub group. Their knowledge, attitude & practice regarding BMW was assessed by using semi-structured questionnaire. The data was analysed using proportions and percentages. The details are presented in Table 1, 2 and 3.

Table 1 shows that <50% of nursing staff and <25% of MPWs had the knowledge of colour coding and segregation. It also shows poor knowledge regarding disposal of sharps among technicians and MPWs. All the categories of health care workers have good knowledge about infectious diseases transmitted due to improper management of waste and the responses received were, HIV, HBV, HCV, air borne infections, TB, Water borne infections.

Majority of the HCWS desired to increase their knowledge regarding BMW as shown in Table 2. Questionnaire on the practice of BMW as in Table 3 showed that segregation & colour coding was not followed properly. Nearly 41% of nursing staff and 10% of technicians revealed that they recap the needle. 50% of the doctors (residents) and nursing staff and 74% of the laboratory technicians have not undergone training in BMW management. None of the MPWs have received training regarding BMW management. Majority of the HCWs had not received Hepatitis B vaccine.

All the categories of health care workers had good knowledge about infectious diseases transmitted due to improper management of waste and the responses received were HIV, HBV, HCV, air borne infections, TB, Water borne infections.

Regarding the problems faced by doctors and staff nurses, the responses obtained were poor availability of gloves & gowns and plastic bags, needle destroyers, less man power, less strict rules, lack of team work and busy work schedule.

Suggestions provided by lab technicians mentioned that they require more training in bio-medical waste management.

The suggestions provided by staff nurses included that guidelines should be implemented at all levels and training was needed in bio-medical waste management. They stressed on team work, inspection and supervision of BMW management and protective devices to be provided for MPWs.

**Table No 1: Number of correct response for questions on Knowledge regarding bio-medical waste**

S.No	Questions regarding Knowledge on biomedical waste management	Doctors (n=63)	Nursing staff (n=154)	Lab- (n=23) technicians	MPW s (n=97)
		n (%)	n (%)	n (%)	n (%)
1.	Knowledge about bio-medical waste generation and legislation	60 (95.2)	143 (92.9)	23 (100)	8 (8.2)
2.	Health care waste is hazardous	63 (100)	145 (94.2)	21 (91.3)	97 (100)
3.	Correct statement signifying bio-medical waste *	63 (100)	101 (65.6)	23 (100)	97(100)
4.	Biomedical waste is segregated at source	62 (98.4)	113 (73.4)	5 (21.7)	55 (56.7)
5.	As per BMW rules, waste should not be stored beyond 48 hours	35 (55.6)	34 (22.1)	11 (47.8)	61 (62.9)
6.	Awareness of separate colour coding containers	63 (100)	147 (95.5)	23 (100)	66 (68)
7.	Understanding of colour coding				
	Yellow bag	60 (95.2)	68 (44.2)	20 (87)	22 (22.7)
	Red bag	59 (93.7)	59 (38.3)	14 (60.9)	19 (19.6)
	Black bag	59 (93.7)	79 (51.3)	19 (82.6)	21 (21.6)
	Blue container	58 (93.1)	53 (34.4)	10 (43.5)	25 (25.8)
8.	Awareness about discarding objects causing punctures or cuts	57 (90.5)	131 (85.1)	13 (56.5)	27 (27.8)
9.	Awareness about discarding of needles	59 (93.7)	113 (73.4)	12 (52.2)	39 (40.2)
10.	Identification of Bio-hazard symbol	63 (100)	95 (61.7)	23 (100)	21 (21.6)
11.	Yes, needle stick injury is a concern	63 (100)	140 (90.9)	13 (56.5)	97 (100)
12.	Reporting of accidental injury to medical officer/infection control doctor	56 (88.9)	19 (12.3)	8 (34.8)	83 (85.6)
13.	Awareness about universal/standard precautions	63 (100)	154 (100)	23 (100)	70 (72.2)
14.	There is no incinerator in our hospital	63 (100)	93 (60.4)	19 (82.6)	35 (36.1)

All the categories of health care workers have good knowledge about infectious diseases transmitted due to improper management of waste and the responses received were, HIV, HBV, HCV, air borne infections, TB, Water borne infections.

**Table No 2: Attitude regarding bio-medial waste management**

S.No	Questions regarding attitude on biomedical waste management	Doctors (n=63)	Nursing staff (n=154)	Lab- (n=23) technicians	MPW s (n=97)
		n (%)	n (%)	n (%)	n (%)
1.	Safe management of bio-medical waste is an issue	63 (100)	127 (82.5)	16 (69.6)	97 (100)
2.	Waste management is a team work	63 (100)	122 (79.2)	17 (73.9)	97 (100)
3.	Safe management increases the financial burden of the hospital	28 (44.4)	49 (31.8)	10 (43.5)	48 (49.5)
4.	Waste management is a part of my responsibility	63 (100)	138 (89.6)	16 (69.6)	31 (32)
5.	Safe management of health care waste is an extra burden of work	28 (44.4)	42 (27.3)	6 (26.1)	47 (48.5)
6.	I would like to attend programmes that enhance and upgrade my knowledge on biomedical waste management	63 (100)	138 (89.6)	23 (100)	97(100)
7.	It is important to report pollution control board if an institution is not complying with the guidelines of bio-medical waste management	51 (81)	141 (91.6)	8 (34.8)	78 (80.4)

**Table 3: Practice on bio-medical waste management**

S. No	Questions regarding practice on biomedical waste management	Doctors (n=63)	Nursing staff (n=154)	Lab- (n=23) technicians	MPW s (n=97)
		n (%)	n (%)	n (%)	n (%)
1.	Disposal of sharps in puncture proof container	63 (100)	109 (70.8)	15 (65.2)	32 (33)
2.	Disposal of expired or contaminated drug in black colour bag	50 (79.4)	72 (46.8)	2 (8.7)	33 (34)
3.	Disposal of used gauze piece in yellow colour bag	63 (100)	131 (85.1)	21 (91.3)	96 (98.9)
4.	Practice of not recapping the used needle	63 (100)	91 (59.1)	21 (91.3)	97 (100)
5.	Discarding of used needles in needle destroyer	52 (82.5)	96 (62.3)	20 (87)	97 (100)
6.	Vaccinated against hepatitis-B	51 (81)	105 (68.2)	17 (73.9)	56 (57.7)
7.	Undergone training in bio-medical waste management	32 (50.8)	74 (48.1)	6 (26.1)	0

#### 4. Discussion

The waste generated during the delivery of health care services carries a high potential of infection and injury than any other type of waste and 10-25% of them are infectious in nature.[2] This study was conducted in a tertiary care hospital in Puducherry (Indira Gandhi Govt Medical College and Research Institute) among health care personnel. A total of 337 personnel participated in the study (63 residents, 154 nursing staff, 23 lab technicians & 97 MPWs).

The BMW is generated by various sources. The major sources are Govt. hospitals and private hospitals, primary health centers, medical colleges and veterinary colleges and animal research centers.[7] There is particular concern about infection with human immunodeficiency virus (HIV) and hepatitis viruses B and C, for which there is strong evidence of transmission via health-care waste, especially sharp injuries.

The study showed that >95% of the doctors had knowledge regarding BMW management

guidelines & segregation. However most of the nursing staff (50%) and MPWs(80%) had poor knowledge regarding the colour coding for segregation of waste and also were not aware that segregation had to be done at the point of generation. The study also revealed that the technicians and nursing staff were not aware about the reporting of needle stick injury and neither were practicing needle destruction or avoiding recapping of used needles. This was similar to the findings of studies done in Rajkot, Jaipur and Karnataka.[4][8][9]

With respect to the attitude regarding the waste management, majority felt that it was a team work and all were responsible for safe disposal. About 45% of doctors & MPWs felt that it increases their workload.

The study showed that nearly 50% of residents and nursing staff and almost all the laboratory technicians and MPWs had not received any kind of training in BMW management. We conduct training programme once in a year for the residents and nursing staff emphasizing on standard precautions and BMW management. The laboratory technicians and MPWs were not included in the programme. This study has helped us in identifying this gap and the necessity for training them. This study has also made us realize that such training programmes should be conducted regularly and make it compulsory for all the HCWs to attend.

A multicentric study conducted in 20 states across India showed that most of the healthcare centres had unsatisfactory practices with respect to BMW management. At the global level 16-84% of the hospitals did not stick to norms. This has been attributed to lack of awareness, inadequate resources and poor disposal mechanisms.[10] Around 82 per cent of primary, 60 per cent of secondary and 54 per cent of tertiary care health facilities were in the 'RED' category which meant that there was no credible BMW management system in place.[10]

While most of the studies have shown poor knowledge & practices, few studies like that of Yadannanavar et al in Bijapur, Karnataka[11] has shown that HCWs have good knowledge & practices of BMW and also a report submitted by Rao.[12]

Studies in other developing countries like Iran, Bangladesh and Pakistan also have similar findings, showing lack of knowledge, insufficient availability of personal protective equipment (PPE), insufficient separation of hazardous & non-hazardous waste, lack of policy and laws for waste management.[13][14][15] Similar findings were recorded in our study where the HCWs expressed their difficulty in following norms due to non-

availability of gloves, gowns(PPE), needle destroyers, lack of coloured bins and covers/bags, lack of supervision.

Our study showed that >90% of HCWs including the MPWs had the knowledge of health hazards due to improper waste management.

With the findings in our study, the BMW management needs to be improved in our hospital. This can be achieved by conducting regular training programmes for the HCWs and updating them, providing the necessary resources like PPE, coloured bags for disposal, having enough supply of disinfectants and to develop protocols for disinfection, transportation & disposal of waste. By displaying posters of colour coding & segregation of waste at various points of generation of waste in the hospital. Regular surveillance and monitoring of the practices is also needed.

This study also showed that about 35% of nurses and technicians and 43% of MPWs are not vaccinated against Hepatitis B. The institute has to take necessary steps and ensure that they are vaccinated.

Common bio waste treatment facility in each city/town with strict monitoring of these facilities by regulatory agency should be implemented[16]. Our hospital uses the treatment facility of Government hospital, Puducherry. Such common facility utilization reduces the economic burden. It is the primary responsibility of Health administrators to manage hospital waste in most safe and eco-friendly manner[2].

The limitations of the study was since it was based on semi-structured questionnaire, every aspect of KAP could not be assessed and not much details on problems faced by HCWs and their suggestions could be obtained.

## 5. Conclusion

This study shows that there is lack of knowledge regarding segregation & colour coding of waste among nurses and MPWs. It also reveals that enough precautions are not being taken for preventing needle stick injuries. The technicians and MPWs have not undergone any training in BMW handling & disposal. Many of the HCWs have not received Hepatitis B vaccine. The multi-purpose workers have got positive attitude and not a good practice due to lack of knowledge. Further intervention can be done by providing training programmes, so that the knowledge on the bio-medical waste management can be improved. Constant supervision and implementation at each level of waste management is needed.

If we need to protect our environment and health of community we must sensitize ourselves, motivate ourselves to this important issue not only in the interest of HCWs but also in the interest of community.

### Acknowledgement

The authors acknowledge the ICMR, New Delhi, India for providing Short term research studentship (STS) to the second author (BE) under the guidance of first author (MA). (STS Ref ID: 2014-02205)

### References

- [1] Biomedical Waste (Management and Handling) Rules 1998, 2000, Ministry of Environment and Forests Notification, New Delhi.
- [2] Safe management of waste from health care activities. WHO, Geneva; 1999.
- [3] Central pollution control board. Environmental standard and guidelines for management of hospital waste. CPCB, Ministry of Environment and Forest, New Delhi, 1996.
- [4] Chudasama RK, Rangoonwala M, Sheth A, Misra SKC, Kadri AM, Patel UV. Biomedical Waste Management: A study of knowledge, attitude and practice among health care personnel at tertiary care hospital in Rajkot. *J Res Med Den Sci* 2013; 1:17-22.
- [5] Mathur V, Dwivedi S, Hassan MA, Misra RP. Knowledge, attitude, and practices about biomedical waste management among healthcare personnel: A cross-sectional study. *Indian J Community Med* 2011; 36:143-5.
- [6] Karthikeyan G and Karthikeyan S. Evaluation of Biomedical Waste Treatment Facility in Chennai, India. Proceedings of the International Conference on Sustainable Solid Waste Management, 5 - 7 September 2007, Chennai, India. pp.176-81
- [7] Mathur P, Patan S and Shobhawat AS. Need of Biomedical Waste Management System in Hospitals - An Emerging issue - A Review. *Curr. World Environ* 2012; 7(1): 117-24.
- [8] Ismail I M, Kulkarni A G, Kamble S V, Borker S A, Rekha R and Amruth M. Knowledge, attitude and practice about bio-medical waste management among personnel of a tertiary health care institute in Dakshina Kannada, Karnataka. *Al Ameen J Med Sci* 2013; 6(4):376-80.
- [9] Sharma A, Sharma V, Sharma S, Singh P. Awareness of Biomedical Waste Management Among Health Care Personnel in Jaipur, India. *OHDM* 2013; 12(1):32-40.
- [10] INCLEN Program Evaluation Network (IPEN) study group, New Delhi, India. Bio-medical waste management: situational analysis & predictors of performances in 25 districts across 20 Indian States. *Indian J Med Res* 2014; 139:141-53.
- [11] Yadavannavar MC, Berad AS, Jagirdar PB. Biomedical Waste Management. A Study of Knowledge, Attitude, and Practices in a Tertiary Health Care Institution in Bijapur. *Indian J Community Medicine* 2010; 135(1):170-1.
- [12] Rao PH. Hospital waste management—awareness and practices: A study of three states in India. *Waste Manag Res* 2008; 26:297-303.
- [13] Askarian M, Vakili M, Kabir G. Hospital waste management status in university hospitals of the Fars province, Iran. *International Journal of Environmental Health Research* 2004; 14: 295-305.
- [14] Hassan MM, Ahmed SA, Rahman KA, Biswas TK. Pattern of medical waste management: existing scenario in Dhaka City, Bangladesh. *BMC Public Health* 2008; 8: 36.
- [15] Kumar R, Samrongthong R, Shaikh BT. Knowledge, Attitude And Practices of health staff regarding infectious waste handling of tertiary care health facilities at metropolitan city of Pakistan. *J Ayub Med Coll Abbottabad* 2013; 25(1-2):109–12.
- [16] Radha KV, Kalaivani K and Lavanya R. A Case Study of Biomedical Waste Management in Hospitals. *Global Journal of Health Science* 2009; 1(1):82-8.