



## AWARENESS AND PRACTICES REGARDING HOSPITAL WASTE AND ITS SEGREGATION, LABELLING AND RECORD KEEPING AT DIFFERENT LEVEL OF HEALTH CARE DELIVERY SYSTEMS IN WEST BENGAL, INDIA.

### Community Medicine

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### ABSTRACT

**Background:** Health care centers generates large amount of Bio-Medical Waste (BMW), which needs to be properly segregated and treated. The waste produced has a higher potential for infection and injury than any other type of wastes. Effective management of hospital wastes is considered as legal as well as a social responsibility. This study was conducted to assess the knowledge and practice of segregation, labelling, transportation and record keeping of biomedical waste management adopted by different health care personnel in different health care level.

**Material and methods:** A cross sectional study were conducted among the doctors, nurses, technician and non-paramedical staffs of different health care centre in Amdanga community block, West Bengal. 714 study participants were assessed using pretested questionnaire. Kruskal – Wallis test was applied to assess the difference in knowledge among different health care workers.

**Results:** All the doctors and 87.93% of the nurses, 71.43% of technicians and only 53.57% of the sweepers have correct knowledge about the types of biomedical waste. About segregation of health care waste majority of nurses (67.6%), doctors (58.6%) and only (10.7%) of technicians had correct knowledge. Only 3.7% of nurses and 5.4% of technicians had correct knowledge about labelling of waste bags.

**Conclusion:** There is paucity of knowledge among the healthcare providers in managing healthcare wastes which adversely affects their practice. There should be regular comprehensive training programs regarding BMW management for all level of healthcare workers including undergraduate students and strict implementation of them

### KEYWORDS

Health care wastes, health care providers, knowledge, practices, segregation, training programs.

### INTRODUCTION

Bio-medical waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps. Bio-Medical waste includes all the waste generated from the Health Care Facility which can have any adverse effect to the health of a person or to the environment in general if not disposed properly. [1] This waste consists of the materials which have been in contact with the patient's blood, secretions, infected parts, biological liquids such as chemicals, medical supplies, medicines, lab discharge, sharps metallic and glassware, plastics etc. This waste needs a special regulations and attention for their proper disposal. However the mismanagement of hospital waste management is an ongoing issue which is been viewed from both a public health problem and environment aspects. [2]

Any waste form a health care facility is considered as hazard when it possess the following characters like infectious, irritating, reactive, flammable, corrosive, radioactive, explosive and bio-accumulative. [3] But majority of healthcare waste accounts for infectious and sharp wastes which possess possible risk to the community. Due to the wide acceptance of single use disposable items (ex- gloves, plastic syringes, medical packages, bedding, tubing, and containers) the quantity of health care waste generation has been increasing. World Health Organization (WHO) revealed that health care workers - doctors, nurses, pharmacist and other nonmedical staff members are the most affected by the hazards of biomedical waste. [4] This is because they have higher chance of exposure to healthcare wastes and increased risk of infections due to indiscriminate management of waste.

WHO has regulated the guidelines to ensure the safe and environmentally sound management of health care wastes which can prevent adverse health and environmental impacts from such waste including the unintended release of chemical or biological hazards, including drug-resistant microorganisms, into the environment thus protecting the health of patients, health workers, and the general public. However despite the tremendous efforts at international and national level, unsafe injections were still responsible for as many as 33 800 new HIV infections, 1.7 million hepatitis B infections and 315 000 hepatitis C infections worldwide. Additional hazards occur from scavenging at waste disposal sites and during the handling and manual sorting of hazardous waste from health-care facilities. [5] Lack of awareness about the health hazards related to health-care waste, inadequate training in proper waste management, absence of waste management and disposal systems, insufficient financial and human resources and the low priority given to the topic are the most common problems related to the hazards of health-care waste. With this concern, we conducted a study to assess the knowledge and practice of segregation, labelling and record keeping of biomedical waste management adopted by different health care personnel in different health care level.

### MATERIALS AND METHODS

#### Study design

The study was a cross sectional study conducted among health care professional from seven sub center, one primary health care center and one secondary / district hospitals and one tertiary care hospital under Amdanga Rural Community development block, Kolkata, India.

#### Study duration

The study was conducted from January 2019 to November 2019

**Study population**

The study population comprised of doctors, nurses, technicians and sweepers at the sub center, primary and secondary health care center and tertiary care teaching hospital.

**Sampling method**

According to Census 2011, there were 24 blocks in Barasat district, West Bengal. Simple random sampling using lottery method (without replacement) was used to select one block- Amdanga block. The study block consists of one tertiary care hospital, one Primary Health Centers and 25 Sub-Centers under the Amdanga Rural Hospital, out of which seven Sub-centers namely Rajberia, Hisabi, Hamidpur, Rafipur, Kamdebpur, Bodai, and Madhavpur were selected by simple random sampling. All the doctors, nurses, technicians and sweepers at primary, secondary level of health care delivery system and 25% of study population from tertiary care teaching hospital were selected department / unit wise by simple random sampling. A total of 714 study participants were included in the study. Exclusion criteria: The participants not willing to participate in the study and not able to contact after 3 visits

**Data collection procedure**

On approval from the West Bengal University of Health Sciences, permission from heads of all related care facilities were obtained. After obtaining written informed consent, a self-administrated questionnaire was given to the study participants and the data was collected.

**Study instruments**

A pretested validated questionnaire was used to collect the data for different health care staffs in a health care system. The study instrument was pretested with 10% of study population in different settings and necessary changes were made. The questionnaire comprises two sections (i) details of sociodemographic profile (ii) Knowledge and practices regarding biomedical waste management at different level of health care system

**Outcome variables**

The outcome variables include those which assess the knowledge and practices of biomedical waste collection , onsite and offsite segregation, onsite treatment using chemical disinfection, labelling, transportation, waste tracking and record keeping among different health care staffs at different health care level.

**Statistical Analysis**

Data was analyzed using Statistical Package for Social Sciences (SPSS -IBM) software version 23. The collected data were tabulated using frequency distribution table. Kruskal – Wallis test was applied.

**Ethical consideration and confidentiality**

Institutional Ethical Committee approval was obtained before the starting of the study. The details of the study participants were kept confidential throughout the study.

**RESULTS AND ANALYSIS**

**Table -1: Distribution of study participants at different levels of health care facilities.**

S. No	Health care personnel (n=714)	Primary care level (%)	Secondary care level (%)	Tertiary care level (%)
1	Doctors	1(0.14)	57(7.99)	198(27.77)
2	Nurses	10(1.4)	135(18.93)	145(20.34)
3	Technicians	1(0.14)	30(4.21)	25(3.51)

**Table-5: Distribution of knowledge about components and segregation of health care waste among the study participants**

S.No	Variables	Level of Knowledge	Primary care level (n <sub>1</sub> = 12) (%)	Secondary care level (n <sub>2</sub> = 222) (%)	Tertiary care level (n <sub>3</sub> = 368) (%)	P value
1	Components of health care waste	Correct	0	10(4.5)	35(9.5)	0.001 <sup>†</sup>
		Partially correct	6(50)	117(52.7)	221(60.1)	
		Incorrect	6(50)	95(42.8)	112(30.4)	
2	Purpose of segregation	Correct	0	34(15.3)	64(17.4)	0.787 <sup>**</sup>
		Partially correct	12(100)	173(77.9)	27(73.9)	
		Incorrect	0	15(6.8)	32(8.7)	
3	Segregation of health care waste	Correct	3(25)	127(57.2)	222(60.3)	0.030 <sup>***</sup>
		Partially correct	8(66.7)	80(36)	138(37.5)	
		Incorrect	1(8.3)	15(6.8)	8(2.2)	

\* Kruskal Wallis Test Value = 13.217, df = 2; \*\* Kruskal Wallis Test Value = 0.478, df = 2; \*\*\* Kruskal Wallis Test Value = 6.986, df = 2.

4	Sweepers	8(1.12)	42(5.89)	61(8.56)
	Total	20(2.80)	264(37.03)	430(60.17)

Majority of the respondents (60.17%) were posted at the tertiary care level, 37.03% at the secondary care level and only 2.80% were functionaries at the primary care level.

**Table -2: Distribution of knowledge about different types of biomedical waste among the study participants**

S. No	Health care personnel	Knowledge about BMW	
		Correct (%)	Incorrect (%)
1	Doctors (n <sub>1</sub> =256)	256(100)	0
2	Nurses (n <sub>2</sub> =290)	255(87.93)	35(12.07)
3	Technicians (n <sub>3</sub> =56)	40(71.43)	16(28.57)
4	Sweepers (n <sub>4</sub> =112)	60(53.57)	52(46.43)

Chi-square = 146.253, df = 3, p = 0.000.

It was observed that all the doctors and 87.93% of the nurses, 71.43% of technicians and only 53.57% of the sweepers have correct knowledge about the types of biomedical waste.

**Table-3: Distribution of knowledge about types of biomedical waste among the study participants at different levels of health care delivery system.**

S. No	Health care level	Knowledge about types of BMW	
		Correct (%)	Incorrect (%)
1	Primary (n <sub>1</sub> =20)	15(75)	5(25)
2	Secondary (n <sub>2</sub> =264)	219(83)	45(17)
3	Tertiary (n <sub>3</sub> =430)	376(87.4)	54(12.6)

Kruskall Wallis Test Value = 3.182, df = 2, p = 0.204.

In table-3, majority of the health care staff at primary care level (25%) had inadequate knowledge about types of biomedical waste when compared to secondary (17%) and tertiary care level (12.6%).

**Table-4: Distribution of knowledge about components and segregation of health care waste among the study participants**

S. No	Variables	Level of Knowledge	Doctors (n <sub>1</sub> = 256) (%)	Nurses n <sub>2</sub> = 290) (%)	Technicians n <sub>3</sub> = 56) (%)
1	Components of health care waste	Correct	35(13.7)	10(3.4)	0
		Partially correct	191(74.6)	135(46.6)	18(32.1)
		Incorrect	30(11.7)	145(50)	39(67.9)
2	Purpose of segregation	Correct	59(23)	39(13.4)	0
		Partially correct	186(72.7)	222(76.6)	49(87.5)
		Incorrect	11(4.3)	29(10)	7(12.5)
3	Segregation of health care waste	Correct	150(58.6)	196(67.6)	6(10.7)
		Partially correct	106(41.4)	93(32.1)	27(48.2)
		Incorrect	0	1(0.3)	23(41.1)

In Table -4, it was observed that majority of doctors (74.6%) and nurses (46.6%) had partial knowledge about component of health care waste. Majority of doctors (72.7%), nurses (76.6%) and technicians (87.5%) had partial knowledge about purpose of segregation. About segregation of health care waste majority of nurses (67.6%), doctors (58.6%) and only (10.7%) of technicians had correct knowledge.

Table -5 shows that majority of health care personnel 50% at the primary care level, 52.7% at the secondary care level and 60.1% at the tertiary care level had partially correct knowledge about the component of health care waste. Regarding purpose of segregation majority of health care personnel 100% at the primary care level,

77.9% at the secondary care level and 73.9% at the tertiary care level had partially correct knowledge. At the primary care level 66.7% functionaries had partially correct and at the secondary and tertiary care level 57.2% and 60.3% respectively had correct knowledge about segregation of health care waste.

**Table-6: Distribution of knowledge about record keeping of biomedical waste among the study participants**

S.No	Variables	Level of Knowledge	Doctors (n <sub>1</sub> = 256) (%)	Nurses (n <sub>2</sub> = 290) (%)	Technicians (n <sub>3</sub> = 56) (%)	Sweepers (n <sub>4</sub> = 112) (%)
1	Person responsible for record keeping	Correct	54(21.1)	117(40.5)	10(17.9)	21(18.8)
		Partially correct	202(78.9)	160(55)	46(82.1)	79(70.5)
		Incorrect	0	13(4.6)	0	12(10.7)
2	Labelling of waste bags	Correct	-	11(3.7)	3(5.4)	-
		Partially correct	-	0	0	-
		Incorrect	-	279(96.3)	53(94.6)	-

It was observed that majority of doctors (78.9%), nurses (55%), technicians (82.1%) and sweepers (70.5%) had partial knowledge about person responsible for record keeping of biomedical waste; and only 3.7% of nurses and 5.4% of technicians had correct knowledge about labelling of waste bags. (Table-6)

**Table-7: Distribution of Practice of segregation of biomedical waste in different wards / units at different level of health care facilities.**

S.No	Variables	Primary care level (n <sub>1</sub> = 40) (%)	Secondary care level (n <sub>2</sub> = 90) (%)	Tertiary care Level (n <sub>3</sub> = 480) (%)
1	Mixing of BMW with general waste	20(50)	45(50)	400(83.33)
2	Segregation of sharp waste	25(62.50)	65(72.22)	235(48.96)

In table-7, it was observed that only 62.5% cases at primary care level, 72.22% cases at the secondary care level and 48.96 % cases at the tertiary care level sharp wastes were properly segregated. Mixing of all other biomedical wastes occurred in 50%, 50% and 83.33% cases at primary, secondary and tertiary care level respectively.

**Table-8: Distribution of Practices of tying at neck and labelling of waste bags in different wards/ unit at different level of health care institutions.**

S.No	Variables	Primary care level (n <sub>1</sub> = 40) (%)	Secondary care level (n <sub>2</sub> = 90) (%)	Tertiary care Level (n <sub>3</sub> = 480) (%)
1	Tying at neck of waste bag with adhesive tape	0	0	11(2.29)
2	Labelling of BMW bag	0	0	11(2.29)

It was observed that 2.29% cases the biomedical waste bags were tied at neck with proper labelling over it at tertiary care level only. (Table-8)

## DISCUSSION

The current study demonstrated inadequate in knowledge and practice in the different sections of biomedical waste management among different cadres of health care workers. Majority of the doctors had adequate knowledge about the different types of biomedical wastes especially in the tertiary health care level. The knowledge of sweepers about the types of health care waste was low. Poorer level of knowledge was due to comparably low educational level and new housing staff coming on rotation to the duty. [6] The training of both the technical and non-technical staff is critical for the suitable and applicable management of health care waste. [7]

In our analysis, the knowledge about the components and segregation about the health care waste was inadequate among doctors, nurses and technicians which was in contrast with the study of Muthukumar et al.,[8] and Mathew et al.,[9] where knowledge about the same was quite high 62.5% and 100% amongst the technicians and paramedical staff respectively. However, differences in knowledge about purpose of segregation among the doctors, nurses and technicians at three levels of health care delivery system were insignificant. Studies showed nurses practiced HCW management better than the doctors

,technical and housekeeping staff and a significant difference was found (P<0.001).[8,10] The reason for the inadequate knowledge could be due to overloading of the patients in casualty and outpatient departments (OPD) with doctors prioritizing patient-care more than health care waste segregation. [11].

It was observed that majority of doctors 202(78.9%), nurses 160(55%), technicians 46(82.1%) and sweepers 79(70.5%) had partial knowledge about person responsible for record keeping of biomedical waste. The equivalent knowledge scores to doctors was found in the technician and housekeeping staff and nursing staff in the present study may be due to higher responsibilities assigned to them in handling of hospital care waste which was similar to findings of previous studies. [12, 13]

Only on 11 (2.29%) occasions the biomedical waste bags were tied at neck with proper labelling over it at tertiary care level. It was also observed that at 18 (100%) wards/units at the secondary and 92(95.83%) at the tertiary care level frequency of collection of biomedical waste bags was correctly practiced. It was observed that only 25(62.5%) occasions at primary care level, 65(72.22%) occasions at the secondary care level and 235(48.96 %) occasions at the tertiary care level sharp wastes were properly segregated. Mixing of biomedical wastes with general waste was seen on 20(50%), 45(50%) and 400(83.33%) occasions at primary, secondary and tertiary care level respectively. Similarly, The Environment Quality Authority conducted a survey in the health care facilities in the West Bank and Gaza Strip, showed that two third of the health care facilities in Gaza Strip collected all types of health care waste together with domestic waste. Sharp items in particular were being collected in special boxes (and sometimes special plastic bottles) as a result of the WHO donating a certain number of boxes; but again, this was practiced in only a limited number (38%) of health care facilities. Only 5% of health care facilities had system for colour coding. [14]

## CONCLUSION

The study concludes that there is inadequate knowledge and inappropriate practices regarding hospital waste among different cadres in a health care system. Managing hospital waste requires effective knowledge among the people who produce the waste, not just those who handle it. Regular training of doctors, nursing, technical and housekeeping staff should be done and system of monitoring should be evolved. Training programs need to focus on empowering the healthcare professionals on biomedical waste management with broad scope and practical knowledge in all aspects. The topic should compulsory be made a part in the practical classes of the undergraduate curriculum and repeated training of biomedical waste management in accredited training centers. Training sessions should be ongoing with refresher training conducted periodically.

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