

## **Knowledge And Practice Regarding Biomedical Waste in Different Levels of Government Health Care Facilities in West Bengal.**

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### **Abstract:**

**Introduction:** Biomedical waste is a serious health hazard for health care providers, patients, and even the general public. Careless disposal of these wastes can lead to environmental pollution and spread of serious disease, among health care providers, patients and general people.

**Methodology:** It was a descriptive, observational, cross-sectional, institution based study conducted in each of primary, secondary, tertiary care level government health institutions of West Bengal to find out the awareness regarding bio-medical waste management, during May 2015 to August 2016. Data was collected by interview technique; simple percentages, ANOVAs were computed with help of Microsoft Excel 2007 software and SPSS software version 18.

**Result:** Most of health care institutions had no provision for training regarding biomedical waste management. None provide prophylactic vaccination (pertaining to biomedical waste) to the health care providers.

**Conclusion:** Correct knowledge and practice regarding bio-medical waste management is essential to reduce the risk of transmission of disease. Awareness generation, regular training, vaccination, should be followed.

**Keywords:** Bio medical waste, Knowledge, Practice, West Bengal.

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### **I. Introduction**

Poor bio-medical waste management poses great risk to doctors, nurses, paramedical staffs, sanitary staffs, hospital maintenance personnel, patients, visitors to the hospitals, support service personnel, workers in waste disposal facilities, scavengers, general public and more specifically to children. It is an occupational hazard to those who generate, collect, segregate, handle, package, store, transport, treat and dispose waste.<sup>1</sup> Healthcare workers face the risk of infection due to blood or other liquid borne pathogens.

Doctors, nurses, healthcare auxiliaries, hospital maintenance personnel and patients in healthcare establishments are exposed to needle stick injuries.<sup>2</sup> Skin injuries by sharp account for 66-95 % of all occupational exposures to blood borne pathogens.<sup>3</sup> A study conducted by Salelkar S among health care workers at a tertiary care hospital in Goa found that 34.8% had experienced a needle stick injury in last year.<sup>4</sup> Sharma and Chauhan had shown that 10-18.5% waste handlers suffered with injury in past 6 months in Govt. and non-Govt. hospitals of Agra and none reported to appropriate authorities.<sup>5</sup> In Pakistan; prevalence of HCV in healthcare workers is 20% while the risk of infection after needle stick injury from Hepatitis B positive patient is 30%.<sup>6</sup> Chia H P et al observed that 171 needle stick injuries were experienced by 44 doctors in one year in a hospital in Singapore.<sup>7</sup>

Correct knowledge and practice regarding bio-medical waste management is essential to reduce the risk of transmission of disease and exposure to pathogens. Low level of knowledge was observed by DeoDeepali et al (in teaching hospitals)<sup>8</sup>; Saini et al (among paramedics in Delhi hospital)<sup>9</sup>; Waseem et al (in Srinagar)<sup>10</sup>; Kishore et al (Delhi hospital dentists in 2000)<sup>11</sup>; Joseph et al (Pondicherry hospital medical staff)<sup>12</sup>; Pandit et al (auxiliary staff at Sabarkantha District, Gujarat)<sup>13</sup>; Yadavannavar M C et al (non-teaching staff at Shri BM Patil Medical College and Hospital, Bijapur)<sup>14</sup> and Sharma S et al (in three apex government hospitals of Agra, Uttar Pradesh)<sup>5</sup>.

Sharma S et al also found that use of protective clothing was bare minimum among waste handlers and health care providers in Agra hospitals.<sup>5</sup> Henry et al at two privately owned community hospitals in two suburbs of Minneapolis observed less than optimal levels of compliance of personal protective clothing among health care workers.<sup>15</sup> Abdul et al had also made similar observations in 44 clinical laboratories of Karachi, Pakistan.<sup>16</sup> In light of the above condition it was intended to assess the knowledge and practice regarding bio-medical waste management among the health care providers in some Govt. institutions at various levels of health facilities in West Bengal, India because there is dearth of knowledge in this field of public health

importance. Experiencing any needle stick injury and utilization of the personal protective equipment by the health care workers were also enquired.

## **II. Methodology**

The present study was a descriptive, observational study with cross sectional multisite based design conducted in some government hospitals of West Bengal during May 2015 to August 2016 to assess the knowledge and practice regarding biomedical waste management among health care providers. The present study included one tertiary hospital (medical College Kolkata), six secondary level Government hospitals (three each of district hospitals and sub divisional hospitals) and three primary levels Government health care facilities (one rural hospital and two block primary health center). The hospitals were selected by simple random sampling. The three district hospitals (DH) were at Howrah (Howrah district), Chinsurah (Hooghly district) and Baharampur (Murshidabad district). The three sub divisional hospitals (SDH) were at Uluberia (Howrah), Srirampur (Hooghly) and Lalbag (Murshidabad). The rural hospital (RH/BPHC) was at Tarakeswar (Hooghly district) and the two block primary health centers were at Amta (Howrah) and Karnasubarna (Murshidabad). Healthcare providers involved in biomedical waste management like doctors, nurses and technicians and biomedical waste handlers of tertiary and secondary and primary level health institutions were included as study population. Inclusion criteria were health care providers, who had given consent and technicians who were directly handling biomedical waste; junior doctors (interns, house staffs, PGT) were included to assess practice regarding biomedical waste management in tertiary level health institution.

The parameters investigated were knowledge about disease transmitted by needle prick, colour coding of bags, collection, transportation, disposal of biomedical waste, use of protective gears, reporting after needle stick injury. To assess the knowledge and practice related to biomedical waste management, healthcare providers and biomedical waste handlers were interviewed with separate predesigned and pretested data collection form.

In tertiary level health care facility, 20% of doctors of each of the selected departments (surgery, gynaecology, orthopaedics and pathology) were interviewed. Similarly, 20% of nursing staffs from each of departments of surgery, gynaecology, orthopaedics (Pathology was excluded because nursing staffs were not present), all technicians of pathology department and 20% of the total biomedical waste handlers of hospitals were also interviewed. Overall 48 doctors, 28 nursing staffs, 7 technicians and 22 biomedical waste handlers were interviewed. Among 48 doctors, 22 were interns, 3 were house staffs and 12 were post graduate trainees in different disciplines. To assess the practice related to biomedical waste management 37 doctors, 28 nursing staffs and 7 technicians and 22 biomedical waste handlers were interviewed.

In secondary level health care facilities, 20% of the doctors, 20% of the nursing staffs and 20% of the biomedical waste handlers and all technicians were interviewed from each of the six hospitals. Total number of doctors, nurses, technician and biomedical waste handlers taken were 55, 96, 26, and 21 respectively. All categories of health care providers were interviewed to assess the knowledge and practice related to biomedical waste management. Doctors were interviewed to assess the knowledge related issues only.

In primary level health care facilities, interviews of all doctors, nurses, technicians and biomedical waste handlers of each healthcare setting were conducted. Total number of doctors, nurses, technician and biomedical waste handlers included in the study were 14, 35, 6, and 8 respectively. All categories of health care providers were interviewed to assess the knowledge and practice related biomedical waste management. Doctors were interviewed to assess the knowledge related issues only.

All total 117 doctors, 159 nurses and 39 technicians and 51 handlers were interviewed to assess the knowledge related biomedical waste management and 37 doctors, 159 nurses and 39 technicians and 51 handlers were interviewed to assess the practice related biomedical waste management.

To assess the knowledge and practice regarding biomedical waste management in health care providers, a simple scoring system was adopted. Simple percentages, ANOVA test and Pearson correlation coefficient was done using Microsoft Excel and software SPSS v18 package.

## **III. Result**

It was observed that 89.7% of doctors and 77.3% of nurses gave correct responses regarding disease transmission by biomedical waste while a minimum correct response was obtained by technicians (15.3%) in this question. Regarding sharp collection, technicians gave maximum correct responses (53.8%) whereas doctors responded minimum (29.0%) in this question. Nursing staffs scored overall better total knowledge score than doctor and technicians. Regarding disease transmission by biomedical waste, PPE, vaccines and needle stick injury doctors scored better than nurses and technicians. Nursing staffs scored better in collection and disposal related questions. (Table 1)

Practice score was highest among doctors than nursing staffs and technicians. Doctors scored much better score than nurses and technicians regarding vaccination and use of personal protective equipment

(PPE). No significant correlation was found in between knowledge and practice score of doctors, nurses, technicians. (Table 2)

There was significant difference of knowledge score and practice score obtained by doctors, nurses and technician on all aspects and collectively as per statistical test (ANOVA) applied. Upon Post hoc test Tuckey Kramer test taking mean score of nurses as baseline, doctors were found to be getting higher knowledge score on disease transmission, PPE, vaccine and needle stick injury aspects but on collection, disposal and overall score they lack behind nurses. Technician obtained poorer scores compared to both doctors and nurses on all aspects of biomedical waste management and collective as well. Again doctors were found to be getting higher practice score on PPE, vaccine and collection, disposal and overall score. Technician obtained poorer scores compared to both doctors and nurses on all aspects of biomedical waste management and collective as well. (Table 3)

No significant correlation was found in between knowledge and practice score of doctors, nurses and technicians.

Maximum correct responses were obtained by handlers regarding colour coding of the bags and least correct responses were on needle stick injury followed by vaccination and method of transportation. Mean knowledge scores of handlers were more in colour coding of bags,

personal protective equipment and vaccination related issues and less in transportation related issues. (Table 4)

Mean practice scores of handlers were more in disposal and less in transportation related question. (Table 5) Knowledge and practice score of handlers showed significant correlation.

Among biomedical handlers 23(45.1%) used gloves whereas 3(5.8%) used both gloves and mask, 28(54.9%) used none of the protective equipment. Doctors, nurses and technicians and handlers sustained needle stick injury 9.2%, 38.1%, 11.8% and 40.7% respectively. Out of total injury only 10.4% reported to appropriate authority.

#### **IV. Discussion**

A health care institution is a multidisciplinary system, which delivers medical care to the community. Hospital's waste poses a wide variety of health and safety hazards for patients and healthcare workers and also for people outside the hospitals area<sup>18</sup>.

##### **Knowledge and practice regarding biomedical waste:**

Higher percentage of correct response among doctors and nurses compared to technicians was consistent with the findings of Mathur et al among hospitals in Allahabad city.<sup>22</sup> Present study also shows that regarding sharp collection, technicians gave maximum correct responses (53.7%) compared to doctors (29.1%). Regarding disease transmission, PPE, Vaccines and needle stick injury, doctors scored better than nurses and technicians. Nursing staffs scored better than doctors and technicians in collection and disposal related questions. Nursing staffs acquired highest overall knowledge score (15.52) than doctors (15.38) and technicians (10.56). Practice score was highest among doctors (7.35) than nursing staffs (4.58) and technicians (2.68). Doctors fared much better than nurses and technicians regarding vaccination and use of protective equipment.

Present study also showed that handlers gave maximum correct responses regarding colour coding of the bags and least correct responses on needle stick injury followed by vaccination and method of transportation. Mean knowledge score was more in general issues and less in transportation. Mean practice score was more in disposal and less in transportation. Knowledge and practice score of handlers showed significant correlation.

Study done by DeoDeepali et al in teaching hospitals shows knowledge regarding general information about biomedical waste was highest in medical staffs followed by paramedical and least in nonmedical staffs. But practical knowledge was highest in paramedical staff and least in nonmedical staff<sup>8</sup>. Saini *et al* had found that 80% of medical staff, about 60% of nursing staff and 20% of cleaning staffs had some knowledge in 600-bed super-specialty tertiary hospital in Delhi<sup>9</sup>. Waseem et al found similar differences in a teaching hospital in Sri Nagar, Jammu and Kashmir<sup>10</sup>. Kishore *et al* shows the majority of the 64 dentists working in a teaching hospital in New Delhi were not aware of proper hospital waste management.<sup>11</sup> Yadavannavar M C et al conducted a study to assess the knowledge, attitude, and practices (KAP) of the Shri BM Patil Medical College and Hospital, Bijapuramomg 180 non-teaching and 154 teaching staffs. The teaching staff of the hospital gave more correct responses (97.4%) to questions on BMW management than the nonteaching staff (80%).<sup>14</sup>

##### **Occupational safety measures:**

Present study shows that 22(43.1%) handlers used gloves whereas 3(5.9%) used both gloves and mask. 28(55%) of biomedical handlers used none of the protective clothing. This finding almost corroborates findings of Sharma S et al<sup>5</sup>. Sharma S et al<sup>5</sup> found that in Sarojini Naidu Medical College, Agra, 17 handlers(31.48%)

reported that they used personal protective clothing during waste handling while the remaining 37 (68.52%) stated that they did not use any type of personal protective clothing (PPC).

Present study also shows that post exposure prophylaxis were available in almost all health institutions except primary level health care settings. Post exposure prophylaxis was missing in primary health care institutions.

GaiRuoyan et al in their study in Shandong province, China shows that all tertiary and secondary hospitals and 63.6% of county hospitals provided protective measures<sup>24</sup>. Rasheeda S et al revealed in their study that two hospitals out of eight teaching hospitals in Karachi, Pakistan provided protective gears for handling dangerous waste to the waste handlers.<sup>25</sup>

Present study has found out that none of the observed health care institutions provided prophylactic immunisation (pertaining to biomedical waste) to the health care providers. In present study doctors, nurses, technicians and handlers sustained 7 (9.2%),27(35.5%),9(11.8%) and 33(43.5%) of total needle stick injuries in last six months respectively.

Out of total injury, only 8 injury( 10.5%) reported to appropriate authority .Present study had shown that single injury reported by handler whereas Mathur et al had shown that none of the injuries were reported by the handlers and injury reporting was low even in other groups of the healthcare providers in hospitals in Allahabad city<sup>22</sup>.

Sharma R et al observed in their study that 37.04% o the health personnel had at least one needle stick injury within six months and none reported to higher authority<sup>26</sup>.

Salelkar S et al conducted a cross-sectional study among health care workers at a tertiary care hospital in Goa to study the problem of needle stick injuries. Around 34.8% (200/575) of the Health care workers had experienced a needle stick injury in the last one year<sup>4</sup>.

Sharma et al conducted cross-sectional study in a tertiary care hospital in Delhi among 322 resident doctors, interns, nursing staff, nursing students, and technicians. A large percentage (79.5%) of Health care workers reported having had one or more needle stick injuries.<sup>22</sup> Aslam M et al conducted a cross sectional, observational study in three public tertiary care hospitals of Karachi in 2007-08. A total of 417 health care workers (doctors, nurses, technicians) participated in the study. Estimated proportion of participants with history of at least one time Needle stick injury (NSI) was found in 66%. None of them sought medical care. Almost 90% of them were not wearing gloves or taking any other protective measures at the time of injury.<sup>27</sup> Askarian et al<sup>28</sup> revealed in their study that in more than half of the hospitals (60%), needle stick injuries are not reported and registered and no regulations for adequate management like post exposure prophylaxis are provided. According to Askarian et al<sup>28</sup>, lack of suitable and sufficient protective equipment, the lack of knowledge regarding the correct usage of equipment and the lack of knowledge regarding the benefits of using protective equipment exposes them to serious dangers.

Low reporting of injuries may be due to the fact that most of the health care providers are unaware about the formal system of reporting which should be established within all the health facilities. Worldwide the occurrence of needle stick injury was found to be quite common. Prevention of needle stick injury is an integral part of prevention programs in the work place, and training of HCWs (health care workers) regarding safety practices needs to be an indispensable ongoing activity at a hospital.

## V. Conclusion

Most of hospitals had no provision for training regarding biomedical waste management. Training of all health care providers especially biomedical waste handlers should be emphasized. None of the health care institutions provide prophylactic vaccination (pertaining to biomedical waste) to the health care providers. There should be provision of prophylacticVaccination among all health care providers. Needle stick injury is an occupational hazard. It should be ensured that every injury is to be reported and documented in separate needle stick injury reporting register. Formal system of reporting should be established in all hospitals.

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**Tables:**

**Table 1.** Distribution of respondents (doctors, nurses and technicians) according to knowledge on biomedical waste related issues. (n=315)

Biomedical waste related issues	Correct responses		
	Doctors (n=117) No. (%)	Nurses (n=159) No. (%)	Technicians (n=39) No. (%)
Disease transmission, PPE, Vaccines (Maximum possible score= 6)			
Diseases transmitted by biomedical waste	105 (89.7)	123 (77.4)	6 (15.4)
Personnel protective equipment (PPE)	52 (44.4)	35 (22)	7 (17.9)
Vaccines	100 (85.5)	122 (76.7)	15 (38.5)
Mean, range, SD	5.18, 3-6, 0.78	4.67, 2-6, 1.04	3.31, 1-5, 0.89
Collection (Maximum possible score=8)			
Sharp	34 (29.1)	54 (34)	21 (53.8)
Anatomical waste	92 (78.6)	93 (58.5)	1 (38.5)
Infectious non sharp waste	69 (59)	85 (53.5)	17 (43.8)
Pharmaceutical waste	56 (47.9)	71 (44.7)	15 (38.5)
Mean, range, SD	4.64, 0-8, 1.88	4.88, 1-8, 1.73	3.49, 0-8, 1.57
Disposal (Maximum possible score= 6)			
Infectious non sharp waste	49 (41.9)	83 (52.2)	15 (38.5)
Anatomical waste	41 (35)	103 (64.8)	18 (46.2)
General waste	76 (65.0)	79 (49.7)	17 (43.6)
Mean, range, SD	3.23, 0-6, 1.57	4.33, 1-6, 1.07	2.56, 0-6, 1.94
Needle stick injury related issues (Maximum possible score=4)			
Protective measures to be taken after needle stick injury.	43 (36.8)	48 (30.2)	6 (15.4)
Reporting	78 (66.8)	70 (44.4)	5 (12.8)
Mean, range, SD	2.33, 0-4, 1.06	1.64, 0-4, 1.12	1.21, 0-4, 1.08
Overall (Maximum possible score 24)			
Overall Mean, range, SD	15.38, 7-23, 3.09	15.52, 10-21, 2.45	10.56, 3-17, 3.25

**Table 2.** Practice score obtained by the doctors, nurses and technicians. (n=215)

Scores	Doctors(n=37)	Nurses(n=159)	Technicians(n=39)
PPE, Vaccines (Maximum possible score=8)			
Mean score	4.83	2.59	1.00
Range	1-8	0-7	0-6
Standard deviation	1.708	1.713	1.649
Collection(Maximum possible score=2)			
Mean score	1.33	0.97	1.08
Range	0-2	0.812	0-2
Standard deviation	0.797	0-2	0.764
Disposal(Maximum possible score=2)			
Mean score	1.20	1.02	0.60
Range	0.648	0.419	0.591
Standard deviation	0-2	0-2	0-2
Total practice score(Maximum possible score=12)			
Mean score	7.35	4.58	2.68
Range	3-11	1-10	1-8
Standard deviation	2.179	1.905	1.607

**Table 3.** Statistical comparison of knowledge and practice score obtained by doctors, nurses

Topics	ANOVA	TUCKEY KRAMER TEST	
		Mean difference of scores	p values
<b>Knowledge score</b>			
Disease transmission, PPE, Vaccines	F=58.72 p=0.000 df=2	Doctors= <b>0.507'</b> Nurse= <b>0'</b> Technician= <b>-1.365'</b>	Doctors-Nurses 0.000 Nurses- Technicians 0.000 Doctors-Technicians 0.000
Collection	F=9.718 p=0.000 df=2	Doctors= <b>-0.239'</b> Nurse= <b>0'</b> Technicians= <b>-1.393'</b>	Doctors- Nurses 0.508 Nurses- Technicians 0.001 Doctors- Technicians 0.000
Disposal	F=170.449 p=0.000 df=2	Doctors= <b>-1.103</b> Nurses= <b>0'</b> Technicians= <b>-1.769</b>	Doctors-Nurses 0.000 Nurses-Technicians 0.000 Doctors-Technicians 0.258
Needle stick injury	F=21.375 p=0.000 df=2	Doctors= <b>0.698'</b> Nurses= <b>0'</b> Technicians= <b>0.430'</b>	Doctors-Nurses 0.000 Nurses-Technicians 0.072 Doctors-Technicians 0.000
Total score	F=52.090 p=0.000 df=2	Doctors= <b>-1.37'</b> Nurses= <b>0'</b> Technicians= <b>-4.958'</b>	Doctors-Nurses 0.915 Nurses-Technicians 0.000 Doctors-Technicians 0.000
<b>Practice score</b>			
PPE, Vaccines	F=41.802 p=0.000 df=2	Doctors= <b>2.051'</b> Nurses= <b>0'</b> Technicians= <b>-1.543'</b>	Doctors-Nurses 0.000 Nurses- Technicians 0.000 Doctors-Technicians 0.000
Collection	F=1.756 p=0.017 df=2	Doctors= <b>0.345'</b> Nurses= <b>0'</b> Technicians= <b>0.063'</b>	Doctors-Nurses 0.115 Nurses- Technicians 0.729 Doctors-Technicians 0.580
Disposal	F=15.564 p=0.000 df=2	Doctors= <b>0.110'</b> Nurses= <b>0'</b> Technicians= <b>-458.'</b>	Doctors-Nurses 0.437 Nurses-Technicians 0.000 Doctors-Technicians 0.000
Total score	F=57.116 p=0.000 df=2	Doctors= <b>2.469'</b> Nurses= <b>0'</b> Technicians= <b>-1.893'</b>	Doctors-Nurses 0.000 Nurses-Technicians 0.000 Doctors-Technicians 0.000

**Table4.** Distribution of biomedical waste disposal handlers according to knowledge of biomedical waste management. (n=51)

Biomedical waste management related issues	Correct responses No.(%)	Knowledge score		
		Mean score	Range	Standard deviation
Colour coding, Personnel protective equipment and vaccination needle stick injury..(Maximum possible score=6)				
Colour coding bags	19(37.3)	3.14	1-6	1.0
Personnel protective equipment	6(11.8)			
Vaccination	4(7.8)			
Needle stick injury related issues(Maximum possible score=2)				
Needle stick injury related issues	2(3.9)	0.92	0-2	0.392
Collection(Maximum possible score=6)				
Needles, slides	6(11.8)	2.37	0-5	1.428
Placenta	16(31.4)			
Catheter, plastics	18(35.3)			
Transportation(Maximum possible score=2)				
Method of transportation	5(9.8)	0.31	0-2	0.648
Disposal(Maximum possible score=4)				

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Placenta	14(27.5)	1.33	0- 3	0.816
Paper	11(21.6)			
Total score(Maximum possible score=20)		8.08	2-11	2.077

**Table 5.**Practice score obtained by the biomedical waste handlers. (n=51)

Items	Practice score		
	Mean score	Range	Standard deviation
Personnel protective equipment and vaccination ,training(Maximum possible score=8)	0.63	0-4	0.48
Transportation(Maximum possible score=2)	0.18	0-2	0.518
Disposal(Maximum possible score=2)	0.69	0-2	0.836
Total score(Maximum possible score=12)	2.08	0-8	1.885