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Rationality in handling biomedical waste: a study on the sanitary workers from a tertiary care hospital in West Bengal

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ABSTRACT

Background: Health-care waste contains potentially harmful microorganisms, which can infect hospital patients, health workers and the general public. The knowledge and practices of sanitary workers needs special attention as these individuals are responsible for managing biomedical waste (BMW) from the point of collection to the point of disposal. The objective was to study the socio-demographic and service profile of the study population and assess their knowledge and practices on Biomedical Waste Management.

Methods: A predesigned, pretested and validated proforma was used for data collection from 120 sanitary workers in the hospital. An observation checklist was used to assess their practices.

Results: Most of the sanitary workers received no formal training before or after joining service (71.67%). Less than 60% of the sanitary workers knew about treatment of waste in hospital, diseases through waste and immunisation. 40.84% of them did not label the bags prior to waste collection and only 30% transported segregated waste in separate trollies

Conclusions: There is a need for enforcement of strict guidelines and measures to improve work safety in hazardous waste collection, transport and handling. Training program on BMW management should be designed to bridge the knowledge attitude and practice gap of sanitary workers.

Keywords: Biomedical waste, Sanitary workers, Knowledge, Practices

INTRODUCTION

The biomedical waste management rules 2016, published by the Central Pollution Control Board (CPCB), Government of India in accordance with the spirit of the Environment (Protection) Act, 1986 provides the regulatory frame work for management of bio-medical waste generated in India. The rules have been revised by the ministry from time to time keeping in view the changing realities, challenges and to ensure better implementation. The act defines "Biomedical waste" (BMW) as 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. The act further classifies biomedical waste into 10 major categories and lays down a system of colour coding for the purposes of segregation, handling, transportation and disposal. The act makes it mandatory for the "occupier" (a person having administrative control over the institution and the premises generating bio-medical waste) to ensure strict adherence to the established standards while "handling" (includes the generation, sorting, segregation, collection, use, storage, packaging, loading, transportation, unloading, processing, treatment,

destruction, conversion, or offering for sale, transfer, disposal) the generated waste. ¹

As per the fact sheet (number 253) published by the World Health Organization, the composition of waste generated by health-care activities includes 85% general non-hazardous waste and 15% hazardous material that may be infectious, toxic or radioactive. Health-care waste contains potentially harmful microorganisms, which can infect hospital patients, health workers and the general public.² There are studies which have reported similar pattern of waste generation in India.³⁻⁵ Hazards arising from indiscriminate & unscientific disposal of BMW can be twofold- on one hand, there is environmental pollution due to burden of a variety of hazardous products and on the other health risks of the individuals who are handling waste potentially infectious material.⁶ The severity of the threat is further compounded by the high prevalence of diseases such as human immunosuppressive virus (HIV) and hepatitis B and C.7

The processes of collection and transportation are the critical steps prior to its final disposal in the entire chain of BMW management. The knowledge and practices of sanitary workers needs special attention as these individuals are responsible for managing BMW from the point of collection to the point of disposal. There are many studies conducted in India to assess the KAP among medical and paramedical personnel, who are concerned with generation of BMW and hence the segregation process. Very few studies focus on sanitary workers who are the backbones of BMW management system. KAP study among these sanitary workers are required to identify the gaps, correct them by training and ultimately aiming towards achievement of high standards in BMW management.

With the above background, our study was conducted in a tertiary care superspeciality postgraduate teaching hospital in West Bengal with the following objectives:

- 1. To study the socio-demographic and service profile of the sanitary workers at S.S.K.M. Hospital, Kolkata.
- 2. To assess the knowledge of study population on biomedical waste management.
- 3. To observe the practices of the study population and identify gaps if any in biomedical waste management.

METHODS

The present study was prospective, observational with cross-sectional design conducted at I.P.G.M.E and R. and SSKM Hospital, Kolkata between May to June 2014. Study population was selected from the list of all sanitary workers available was obtained from the hospital administration, working at the hospital (both permanent and contractual) during that period. All 125 sanitary workers were contacted for their willingness to

participate in the study and 3 did not give consent. However on the day of interview, 2 more were absent. Data was collected on the remaining 120 sanitary workers.

A predesigned, pretested and validated proforma was used for data collection from the study population. Data was collected on socio demographic profile, service details and knowledge of the sanitary workers on various aspects of biomedical waste management. The questions on knowledge assessment were closed ended and the answers obtained were classified as correct or incorrect. In the next phase, all the sanitary workers who participated in the interview were contacted and their practices were observed personally by the interviewers on spot. A checklist was prepared beforehand and the observed practices were recorded as correct or incorrect. The interviewers received prior training for assessment of correct knowledge and practices of sanitary workers regarding BMW management. The strength of our study lies in the fact that the practices of the sanitary workers were recorded by on spot observation by the investigators themselves instead of interviewing them on their practices.

All data were compiled and analysed in Excel. Permission was taken from the Institution prior to data collection. Informed written consent was taken from the study population before the interviews and observations.

RESULTS

Majority of the sanitary workers were in the age group of 41-50 years (28.33%), male (73.33%), primary pass (31.6%), with 40.83% having per capita monthly income of Rs.773 to Rs.1546. 74.17% had an urban origin and 65% stayed outside the hospital campus. However more than half (53.33%) of the study population were addicted to pan, betel nut or tobacco (Table 1).

Most of the sanitary workers were employed on contractual basis (67.5%), received no formal training before or after joining service (71.67%) and had experience less than 10 years (50.83%) (Table 2).

The areas where the study population had unsatisfactory knowledge were - colour of trolley, top cover required for trolley, bio-hazard symbol present on trolley, treatment of waste in hospital, diseases through waste and immunization. Less than 60% of the sanitary workers could actually give correct answers when asked on the above issues during interview (Table 3).

When the sanitary workers were observed handling the BMW on spot, the interviewers noticed that most (40.84%) of them did not label the bags prior to waste collection and only 30% transported segregated waste in separate trollies (Table 4).

Table 1: Distribution of study population according to socio-demographic profile (n=120).

	No. (%)
A co cucuma	NO. (70)
Age groups	24 (20)
21-30	24 (20)
31-40	22 (18)
41-50	34 (28.33)
51-60	18 (15)
>60	2 (1.67)
Sex	
Male	88 (73.33)
Female	32 (26.67)
Origin	
Urban	89 (74.17)
Rural	31 (25.83)
Addiction	
Addicted	64 (53.33)
Not addicted	56 (46.66)
Education	No. (%)
Illiterate	24 (20)
Primary	38 (31.6)
Middle	36 (30)
Secondary	18 (14.99)
College and above	4 (3.33)
Residence	
Inside campus	42 (35)
Outside campus	78 (65)
Income (PCMI in Rs.)	
<773	11 (9.17)
773-1546	49 (40.83)
1547-2576	22 (18.33)
2577-5155	28 (23.33)
>5155	10 (8.33)

Table 2: Distribution of study population according to service profile (n=120).

	No (%)			
Type of service				
Permanent	39 (32.5)			
Contractual	81 (67.5)			
Training status				
Trained	34 (28.33)			
Untrained	86 (71.67)			
Experience (years)				
<5	24 (20)			
5-10	37 (30.83)			
10-15	27 (22.5)			
15-20	10 (8.33)			
>20	22 (18.33)			

Table 3: Distribution of study population according to knowledge on BMW management (n=120).

Knowledge of	Correct	Incorrect
	n (%)	n (%)
Segregation of waste	95 (79.16)	25 (20.83)
Place of generation of waste	113 (94.16)	7 (5.83)
Colour coded bags	102 (85)	18 (15)
Bio-hazards symbols	72 (60)	48 (40)
Placement of bins	99 (82.5)	21 (17.5)
Frequency of collection of bags	110 (91.67)	10 (8.33)
Frequency of collection of anatomical waste	85 (70.83)	35 (29.17)
Washing of bins	102 (85)	18 (15)
Disinfectants	93 (77.5)	27 (22.50)
Time of disposal of waste bags	110 (91.67)	10 (8.33)
Internal transport	98 (81.67)	22 (18.33)
Colour of trolley	22 (18.33)	98 (81.67)
Top cover required for trolley	66 (55)	54 (45)
Bio-hazard symbol present on trolley	43 (35.83)	77 (64.17)
Disposal of BMW waste	85 (70.83)	35 (29.17)
Treatment of waste in hospital	42 (35)	78 (65)
Diseases through waste	61 (50.83)	59 (49.17)
Preventive measures	114 (95)	6 (5)
Immunisation	52 (43.33)	68 (56.67)
Emergency response	90 (75)	30 (25)

Table 4: Distribution of study population according to observed practices (n=120).

Practices observed	Correct	Incorrect
	n (%)	n (%)
Segregation at source of generation	120 (100)	0
Collection in designated bags and bins	119 (99.16)	1 (0.84)
Labelling of bags prior to collection	71 (59.16)	49 (40.84)
Proper placement of bins	102 (85)	18 (15)
Segregated internal transport of collected waste in proper trolley	36 (30)	84 (70)
Disposal of general waste in campus pit	120 (100)	0
Disposal of BMW in campus trench	104 (86.67)	16 (13.33)
Personal protective equipments used by sanitary workers	119 (99.13)	1 (0.87)

DISCUSSION

According to our present study, majority of the sanitary workers were male (73.33%) in the age group of 41-50 years (28.33%), primary pass (31.6%), with 40.83% having per capita monthly income of Rs.773 to Rs.1546. 74.17% had an urban origin and 65% stayed outside the hospital campus. However more than half (53.33%) of the study population were addicted to pan, betel nut or tobacco. Most of the sanitary workers were employed on contractual basis (67.5%), received no formal training before or after joining service (71.67%) and had experience less than 10 years (50.83%).

In a study by Chellamma & Sudhiraj at Thrissur on sanitary workers, 53.6% were males, with 42% belonging to 40 – 50 age group. 14 77.7% of these workers had an educational status of less than 10th standard. 64.6% of them were regular corporation workers. According to Ekram and Safa in the study at Alexandria, 99.4% were males and only were above 30 years. 15 Equal numbers were from urban and rural residence and 55.4% were beyond primary education. The results of above studies reveals that waste management is a livelihood of people of low educational levels, with insufficient family income, poor living conditions and mostly performed by male employees in India and also other countries. 16-18

The areas where the study population had satisfactory knowledge with more than 70% of the population giving correct answers were segregation of waste (79.16%), place of generation of waste (94.16%), colour coded bags (85%), placement of bins (82.5%), frequency of collection of bags (91.67%). Our result is however different from the study by Bansal and Misra where colour coding was known to 6% of sanitary workers and 7% of them were aware that biomedical waste can be stored for maximum of 48 hours. ¹⁹ A study conducted in Allahabad city hospitals by Mathur et al included 60 nurses, 78 lab technicians and 70 sanitary staffs shows that knowledge regarding the colour coding was found to be better among nurses and lab technicians. ¹⁰

In the present study, unsatisfactory knowledge was found regarding the issues like- colour of trolley required for transportation of the segregated wastes (18.33%), top cover required for trolley (55%), bio-hazard symbol present on trolley (35.83%), treatment of waste in hospital (35%), diseases transmitted through waste (50.83%) and immunisation required (43.33%). In a study done in Gwalior 70.73% non-medical staffs had poor management. 19 knowledge of biomedical waste Segregation of BMW at the site of generation is found to be 79.16% among our study population. Similarly Chudasama et al figured out that the correct response for the same was as high as 86.9%.20 Studies conducted in Chennai and Davangere also found out the same to be 82.4% and 70%, respectively. Another study done in Bangalore by Suwarna et al studied the awareness about

categories and treatment of health care waste was present only among 19.3% housekeeping staff.²³

According to Mathur et al, knowledge regarding the potential transmission of disease through biomedical waste was observed among only 27% of sanitary workers, which is lesser than in our study. 10 Few studies have documented the lack of knowledge among health care and sanitary workers regarding the risk of diseases such as HIV and Hepatitis B and C. 12,20 A study conducted by Bansal et al in the district of Madhya Pradesh showed only 43% of sanitary workers were aware of the hazards associated with biomedical waste. 19 Similar study was conducted by the Department of Community Medicine, Gandhi Medical College, Hamidia hospital & Central pollution control board showed that only 60% and 46.6% of sanitary workers were aware of injuries and diseases being caused by BMW. 24

When the sanitary workers were observed handling the BMW on spot, the interviewers noticed that most (40.84%) of them did not label the bags prior to waste collection and only 30% transported segregated waste in separate trollies. A Turkish study also reported inappropriate handling of BM waste at the institutions concerned and that there was no systematic program for the transportation of the health care waste to the final disposal sites.²⁵ Use of personal protective equipments was found to be 99.13% among the sanitary workers in our study. This indicates strict implementation of policies and procedures in the hospital. On the contrary, an Iranian survey performed on the collection and disposal of waste in the university hospitals found insufficient personal protective equipment and lack of knowledge regarding the proper use of such equipment.²⁶

Another study found that the knowledge, attitude and practice scores among sanitary workers to be 38%, 46% and 38% respectively which were significantly lower than that among doctors and nursing staffs may be due the fact that they are less related to direct patient-care. Similarly, many other studies have observed low level of adequate knowledge, attitude and practices among sanitary workers. 12,13 The poor knowledge of the sanitary staffs in our study, could be owing to their poor literacy status- 20% were illiterate and 31.6% of them were only educated till primary standard. However the contractual nature of their appointment, lack of formal training and experience are barriers to achieving technical knowledge and expertise necessary to safeguard their profession as well as their health.

The unsatisfactory level of knowledge & practices regarding BMW management revealed among sanitary workers in the present study shows that there is a need for enforcement of strict guidelines and measures to improve work safety in hazardous waste collection, transport and handling. Considering that only 28.33% of our study population were trained on BMW management, periodic trainings should be designed to bridge the knowledge

attitude practice gap. Askarian and Vakili recommended the compilation of rules and the establishment of standards, along with effective training for personnel.²⁶ Infact it has been demonstrated that with proper training, the proportion of sanitary workers with adequate knowledge on BMW handling increased from 56% to 90%, the proportion for adequate attitude from 32% to 56% and that for adequate practices from 34% to 76%.²⁷ Appropriate systems, including the committees, should be constituted by the hospitals which need to meet periodically to review the status of BMW management issues. Protection against personal injury is essential for all workers and the necessary equipments and vaccinations against common waste related diseases like tetanus, hepatitis etc. should be provided by the hospital authorities.

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REFERENCES

- Government of India. Bio-Medical Waste (Management and Handling) Rules. In: Ministry of Environment Forest and Climate Change, editor. 2016 ed. New Delhi: Gazette of India, Extraordinary, Part II, Section 3, Sub-section (i); 2016: 1-37.
- WHO. Fact Sheet No 253: Health-care waste: WHO; 2015. Available at: http://www.who. int/mediacentre/factsheets/fs253/en/. Accessed on 3 March 2017.
- 3. Pant D. Waste management in small hospitals: trouble for environment. Environ Monitoring Assess. 2012;184(7):4449-53.
- 4. Narang RS, Manchanda A, Singh S, Verma N, Padda S. Awareness of biomedical waste management among dental professionals and auxiliary staff in Amritsar, India. Oral Health Dental Manage. 2012;11(4):162-8.
- 5. Patil AD, Shekdar AV. Health-care waste management in India. J Environ Manage. 2001;63(2):211-20.
- 6. Turnberg WL, Frost F. Survey of occupational exposure of waste industry workers to infectious waste in Washington State. Am J Public Health. 1990:80:1262-4.
- 7. Palwankar PV, Singh A. Safety and measures for auxiliary staff associated with hospital waste disposal. Indian J Dental Sci. 2012;4:104-6.
- 8. Jahnavi G, Raju PV. Awareness and training need of biomedical waste management among undergraduate students, Andhra Pradesh. Indian J Public Health. 2006;50(1):53-4.

- 9. Joseph L, Paul H, Premkumar J, Rabindranath, Paul R, Michael JS. Biomedical waste management: study on the awareness and practice among healthcare workers in a tertiary teaching hospital. Indian J Med Microbiol. 2015;33(1):129-31.
- Mathur V, Dwivedi S, Hassan M, Misra R. Knowledge, Attitude, and Practices about Biomedical Waste Management among Healthcare Personnel: A Cross-sectional Study. Indian J Community Med. 2011;36(2):143-5.
- 11. Patil GV, Pokhrel K. Biomedical solid waste management in an Indian hospital: a case study. Waste Manag. 2005;25(6):592-9.
- 12. Phukan P. Compliance to occupational safety measures among the paramedical workers in a tertiary hospital in Karnataka, South India. Int J Occup Environ Med. 2014;5(1):40-50.
- 13. Rajput A, Deshpande K, Chakole S, Mehta S. Is Biomedical Waste Management Knowledge Adequate in Paramedics & Sanitary Workers in Hospitals of Ujjain City? Ntl J Community Med. 2016;7(3):151-4.
- 14. Chellamma P, Sudhiraj, Vijayakumar A. Morbidity Profile of Sanitary Workers in Thrissur Corporation, Kerala. J Evol Med Dental Sci. 2015;4(89):15468-9.
- 15. Abd El-Wahab EW, Eassa SM, Lotfi SE, El Masry SA, Shatat HZ, Kotkat AM. Adverse Health Problems Among Municipality Workers in Alexandria (Egypt). Int J Prev Med. 2014;5(5):545–56.
- Abou-Elwafa HS, El-Bestar SF, El-Gilany AH, Awad Eel-S. Musculoskeletal disorders among municipal solid waste collectors in Mansoura, Egypt: A cross-sectional study. BMJ Open. 2012;2:e001338.
- 17. Kuijer PP, Frings-Dresen MH. World at work: Refuse collectors. Occup Environ Med. 2004;61:282–6.
- 18. Inyang M, editor. Ljubljana, Slovenia: International Conference "Waste Management, Environmental Geotechnology and Global Sustainable Development (Icwmeggsd'07-Gzo'07)"; Health and safety risks amongst the municipal solid waste collectors in Port Harcourt Metropolis of the Niger Delta Region of Nigeria. 2007: 28-30.
- 19. Bansal M, Misra A. Knowledge and Awareness regarding Biomedical Waste Management among Employees of a Tertiary Care Hospital. IJCH. 2013;25(1):86-8.
- Chudasama RK, Rangoonwala M, Sheth A, Misra SK, 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 Dent Sci. 2013;1:17-22.
- 21. Charania ZK, Ingle NA. Awareness and practices of dental care waste management among dental practitioners in Chennai city. J Contemp Dent. 2011;1:15-21.

- 22. Sudhir KM. Awareness and practices about dental health care waste management among dentists of Davangere City, Karnataka. J Indian Assoc Public Health Dent. 2006;8:44-50.
- 23. Suwarna M, Ramesh G. Study about awareness and practices about health care wastes management among hospital staff in a medical college hospital, Bangalore. Int J Basic Med Sci. 2012;3(1).
- 24. Balamurugan SS, Priyadarsini SP, Justin R, Sonai RP, Rajeswari B, Chakraborty R. A Descriptive Study on Knowledge Regarding Biomedical Waste Management Among Health Care Personnel in a Tertiary Care Hospital. National J Res Community Med. 2014;3(2):186-91.
- 25. Alagöz AZ, Kocasoy G. Improvement and modification of the routing system for the health-care waste collection and transportation in Istanbul. Waste Management. 2008;28:1461-71.

- 26. Askarian M, Vakili M, Kabir G. Hospital waste management status in university hospitals of the Fars province, Iran. Int J Environ Health Res. 2004;14:295-305.
- 27. Ostwal K, Jadhav A, More S, Shah P, Shaikh N. Knowledge, attitude and practice assessment of biomedical waste management in tertiary care hospital: It's high time to train ourselves. Int J Environ Sci. 2015;5(6):1115-21.

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