Original Article

Assessment of future physicians on biomedical waste management in a tertiary care hospital of West Bengal

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Abstract

Background: One-fourths of the biomedical waste (BMW) is regarded as hazardous with the potential for significant health concern for both medical personnel and general community. So, awareness about various aspects of BMW management is required and it was assessed among junior doctors in a tertiary care hospital. **Objectives**: To assess the knowledge and awareness about various aspects of BMW management among junior doctors (future physicians) and thus help the authority to develop the strategy for improving the situation in future. Materials and methods: In this descriptive observational study, we interviewed 200 junior doctors of a tertiary care hospital of Kolkata using a pre-designed pre-tested self-administered, semi-structured, anonymous questionnaire. **Results**: Majority of the participants were in the age group of 22 to 24 years (62%), males (66.5%), hostelites (70.2%), belonged to nuclear family (80.1%), and had per capita monthly family income in the range of Rs 5 000 to 20 000 (61.4%). Almost all respondents (99.1%) heard about BMW, 94.4% heard about the BMW rule 1998, and 67.9% knew about the Bio Hazard symbol. Only 55.9% respondents could remember the ten category of BMW. Segregation at source (the golden rule of BMW) was known by 78.8% of the junior doctors, only 29.5% had the knowledge of various methods of final disposal of BMW. Though 98.8% of the study population was aware that improper management of BMW causes different health problems, only 76.4% knew about various types of color-coded bags for collection of BMW. All the junior doctors were trained in all these essential aspects of BMW in their undergraduate curriculum. **Conclusion**: Still, intensive training program and monitoring at regular time interval is needed for all staff, with special emphasis on junior doctors.

Key words: Assessment, biomedical waste, junior doctors, segregation

INTRODUCTION

According to Bio-Medical Waste (management and Handling) Rules, 1998 of India, biomedical waste (BMW) means any solid, fluid, or liquid waste including its containers and any intermediate product 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 10 categories.[1] Between 75% to 90% of the waste produced by the healthcare providers is non-risk or general and it is estimated that the remaining 10% to 25% of healthcare waste is regarded as hazardous with the potential for creating a variety of health problems.[2] Among all health problems, there is particular concern with HIV/AIDS, Hepatitis B and C, for which there is a strong evidence of transmission through healthcare waste. Bio-Medical Waste (management and handling) Rule, 1998, prescribed by the Ministry of Environment and Forests, Government Of India, came into force on July 28, 1998. This rule applies to all those who generate, collect, receive, store, transport, treat, dispose, or handle BMW in any manner and also to every institution that generate BMW. BMW should be segregated at source into color-coded bags or containers and its collection

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and proper disposal should be a significant concern for both medical personnel and general community.[3] Since the implementation of Bio-medical waste rules (1998), every health personnel is expected to have proper knowledge about collection, handling, and disposal of BMW.[4] However, lack of awareness has led to the hospitals becoming a hub of spreading disease rather than working toward eradicating them. Hence, there is a need for resource material to help administrators, doctors, nurses, and paramedical staffs. The objective of BMW management are mainly to reduce waste generation, to ensure its efficient collection, handling, as well as safe disposal in such a way that it controls infection and improves safety for employees working in the system. For this to happen, a conscious, coordinated, and cooperative effort has to be made from physicians to ward-boys. With this view of context, the present study was carried out to assess the knowledge and awareness about various aspects of BMW management among junior doctors (future physicians) of a tertiary care hospital of West Bengal, so that this current status of knowledge can help the authority to develop the strategy for improving the situation in future.

MATERIALS AND METHODS

Study settings were at the tertiary care hospital of Kolkata. Type of study was a descriptive observational hospital-based epidemiological study. Study design was cross-sectional in nature. Study population was junior doctors (Interns and House-staffs) of that hospital. Study period/time for study was January 2011 to April 2011. Study tool was a pre-designed pretested self-administered, semi-structured, anonymous questionnaire. The questionnaire had two parts. First part contained sociodemographic variables such as age, sex, place of residence, type of family, and per capita monthly income. The second part contained various aspects of BMW management. A pilot study for pretesting was carried out among 20 junior doctors. Then, rectification of the questionnaire was done by necessary correction and modification and structuring was done before final data collection.

Study variables were age, sex, residence, type of family, per capita monthly income, heard about Bio-Medical waste, BMW rule, Bio-hazard symbol, Category of BMW, Segregation at source, collection at color-coding bags, various methods of final disposal, and health problems due to BMW. Main outcome variables were knowledge about BMW management. Study technique was administration of the questionnaire. Sample Size was 200 (two hundred) junior doctors. Sampling design was convenient sampling technique. All interns and house-staffs were sample frame as they were feasibly approachable and available and census population of these two groups participated in our study.

Data collection techniques

Before actual study, permission was obtained from the authority. A questionnaire was designed and pretesting of the same was done for validity. Date and time were fixed up. All interns and house-staffs were invited for the study. The participants were informed about the purpose of the study and their informed verbal consent was taken. They were assured about their confidentiality and anonymity. They were given option that they may or may not join in the study. Then, the questionnaire was administered and they were requested to fill it up and data were collected. The unwilling and absentee were excluded from the study.

Data analysis

Finally, the collected data were tabulated and interpretations were done by proper statistical method (Percentage and Z test).

RESULTS

A total of 200 junior doctors were studied by a self-administered questionnaire. The response rate was cent percent. It was seen that majority of the study population were in the age group of 22 to 24 years (62%), males (66.5%), and hostelites (70.2%). Maximum (80.1%) belonged to nuclear family. 61.4% had their per capita monthly income of Rs 5 000 to 20 000 [Table 1].

Table 1: Sociodemographic profile of the study population (N = 200)

Characteristics	Number	(%)
Age (in years)		
20-22	36	18.0
22-24	124	62.0
24-26	40	20.0
Sex		
Male	133	66.5
Female	67	33.5
Type of family		
Nuclear	160	80.1
Joint	40	19.9
Place of residence		
Hostelite	140	70.2
Day scholar	60	29.8
Per capita monthly family income (Rs)		
<5000	23	11.6
5000-20,000	122	61.4
>20,000	54	27.0

Table 2: Analysis of knowledge about biomedical waste

Knowledge	Number	(%)
Heard of bio-medical waste	198	99.1
Heard about BMW rule, 1998	188	94.4
Know about bio hazard symbol	136	67.9 (Z = 8.40, $P < 0.05$)
Awareness about different		
Category of BMW	112	55.9 (Z = 10.34, $P < 0.05$)
Knowledge about segregation at source	157	78.8 (Z = 6.47, $P < 0.05$)
Various methods of disposal	60	29.5 (Z = 14.52, $P < 0.05$)
Perception about different		
health problems due to BMW	197	98.8
Know about color coding bags	152	76.4 (Z = 6.92, $P < 0.05$)

BMW: Biomedical waste

Our study revealed knowledge about various aspects of BMW [Table 2]. Almost all respondents (99.1%) heard about BMW. However, 94.4% of them heard about the BMW rule, 1998. Almost two-third (67.9%) of the study population knew about the Bio Hazard symbol (Z = 8.40, $P < 0.05$). Only 55.9% respondents could remember the ten category of BMW, though it was in their MBBS curriculum (Z = 10.34, $P < 0.05$). Segregation at source—the golden rule of BMW—was known by more than three-fourth (78.8%) of the junior doctors (Z = 6.47, $P < 0.05$). Only 29.5% of our study population had the knowledge of various methods of final disposal of BMW (Z = 14.52, $P < 0.05$). Being a healthcare professional, 98.8% of the study populations were aware that improper management of BMW causes different health problems. 76.4% knew about various types of color-coding bags for collection of BMW (Z = 6.92, $P < 0.05$).

DISCUSSION

In this study, the junior doctors involved were assessed about their knowledge of BMW management. Interestingly, the study revealed that their awareness were moderately satisfactory indicating lack of required knowledge about BMW management.

Our study showed that 99.1% of the study population heard about BMW, which was quite higher than other studies. In a study among paramedical workers at Andhra Pradesh, this rate was only 53.2%.[5] However, another study by Saini *et al.* at Delhi among residents and consultants revealed more or less similar result like our study.[6] The difference of knowledge may be due to the difference of literacy status between junior doctors, residents, consultants, nurses, and paramedical workers.

About 94.4% of our study population knew about BMW (Management and Handling) rule 1998, which was quite similar to some other studies.[6,7] Delhi study noted that 85% of consultants and 81% of residents knew about the BWM rule and Gujarat study showed that all doctors knew about the law.[6,7] But a study by Sharma S at Agra revealed lack of knowledge about the legislation among health personnel.[8] A study by Deo *et al.* among employees of a rural area showed some intermediate result, i.e., 54.88% paramedical staff and 47.58% medical staff were aware about the BMW rule and Puducherry study by Joseph also showed that almost half of the healthcare personnel including Doctors, House staff, and students were aware of the legislation.[9,10]

Despite being a doctor, only two-third (67.9%) of the interns and house-staff knew about the bio-hazard symbol indicating need of sensitization program among them. In a study at Puducherry, only 15% of healthcare workers knew about bio-hazard symbol.[10]

There were ten categories of BMW which was known by 55.9% of our study population. A study at Andhra Pradesh showed that only 1.6% of their study population knew about these categories, which were probably due to the fact that their study populations were the paramedical staff.[5]

Segregation at source, the golden rule of BMW management, was known by 78.8% of our junior doctors. Findings similar to that in our study were observed by some other authors.[5,9,10,11] Deo *et al.* showed in their study that 90% of paramedical and 80.6% of medical staff were aware of this, whereas Puducherry study showed it was 82% and A.P study showed it was 70.6%.[5,9,10] A study at Bijapur of Karnataka revealed that majority of their staff knew about segregation of BMW at source.[11]

Different color-coding bags for segregation was one of the most important parts of BMW management rule which was known by 76.4% of respondents of our study. Very low knowledge was reported by some other studies.[9,10] Deo *et al.* showed that only 28.62% of paramedical and 20.23% of medical staff knew about this issue, whereas 74% of Puducherry study participants did not know about color coding of the BMW bags.[9,10] Very high knowledge was seen in a study at Johannesburg Hospital by Ramokate and Basu among doctors and nurses where 96% knew about various types of bins.[12]

From our study, it was seen that there was a gap of

knowledge about segregation and color-coding bins which needs correction. Various methods of final disposal of BMW was known by only 29.5% in our study, which was similar to Puducherry study.[10] However, Bijapur study revealed higher result where majority were conscious about transport and final disposal of BMW.[11] Andhra Pradesh study showed lower result where only 14.4% had knowledge about various methods of disposal.[5] Deo *et al.* also showed lower result where only 22.53% paramedical and 12.15% medical staff was aware about various methods of disposal.[9] This low knowledge was both surprising and worrying.

Finally, awareness about different health problems due to BMW was assessed and it was seen that 98.8% of interns and house-staffs had good perception about the different diseases transmitted by BMW which was also similar to other studies, where it was 95.8%.[5,7,12,13] Gujarat study by Pandit *et al.* and Bhopal study by Saraf *et al.* showed that all the doctors were aware that improper management of BMW causes different health hazards like infections (HIV/AIDS, Hepatitis B and C), injuries, and environmental pollutions.[7,13] At Johannesburg, 82% of the study population agreed that contact with infective waste could lead to infectious diseases such as HIV/AIDS, 88% Hepatitis B, and 76% Hepatitis C.[12] However, Agra study showed somewhat lower result. In this study, a need to periodically acquaint the participants with the updated BMW management and handling rules was felt.[8]

The strength of our study was that all the junior doctors were trained in all these essential aspects of BMW in their undergraduate curriculum. Still, our study pointed to the loopholes of their gap in knowledge as well as practice at the cross roads of students and healthcare delivery arena.

We had several limitations. We could have involved the middle level doctors as the study participants with the junior doctors as in the percolation theory of knowledge; these junior doctors are a floating mass that will join the mainstream of healthcare management within months of their training in tertiary care settings.

In the future directions of the study, a system of monitoring should be evolved with the intensive training program at regular time intervals for all staff with special emphasis on junior doctors is the call of the day. Information about the risks linked to BMW can be displayed by posters in hospitals giving instructions for segregation. So, from our study, it was seen that in the field of medical practice, statutory public health guidelines for BMW management alone cannot achieve the desired goal, if we cannot motivate and monitor with the help of behavior change communication (BCC) and change in mind set in all strata of medical practice, especially in junior doctors.

To sum up, the present study outlined that being a healthcare professional, the gap between BMW rule and knowledge and awareness of junior doctors had tubular vision on patient care services. This has a downstream effect to pay very little attention to support services in the overall context of comprehensive patient welfare. So, BMW management program cannot successfully be implemented without the willingness, devotion, and self-motivation of all levels of the healthcare delivery personnel, specially budding doctors who will lead the way.

RECOMMENDATIONS AND SUGGESTIONS

1. Intensive training program at regular time interval for all staff with special emphasis on junior doctors is needed.
2. A system of monitoring of information, education and communication (IEC) and practice of BMW management should be evolved.
3. Information about the risks linked to BMW can be displayed by posters in hospitals giving instructions to segregation.

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