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Knowledge, Attitude and Practice Regarding Biomedical Waste Management amongst Future Anaesthetists in a Teaching Tertiary Care Hospital of North India

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ABSTRACT

Biomedical waste (BMW) is hazardous and improper handling can lead to infections and diseases. Effective management of BMW is not only responsibility of hospital but of every individual working in hospital including doctors. Inappropriate handling of BMW has led to increasing incidence of hospital acquired infections (HAI). So, the present study was undertaken among Junior residents (JRs) in a tertiary care hospital with the objective to assess the knowledge, attitude and practices (KAP) regarding BMW as per latest BMW Rules 2016. This will in turn help authorities to develop strategy to take necessary steps to put protocols in place and fill the gaps with future training programmes.

Materials and Methods- Present study was conducted from 2018-2019 among 100 Junior Residents (JRs) of Anaesthesiology Department by administering pre-designed, pretested, self- administered, semi- structured, anonymous questionnaire to them. All results were entered into Microsoft excel sheet and data was analysed. Results were expressed as percentages.

Results- Segregation at source, golden rule of BMW was known by 58% doctors. Only 54% doctors knew that there are four different coloured categories as per BMW rules 2016. Only 67% residents agreed that they have undergone training in BMW management. All doctors agreed that BMW management is teamwork and their own personal responsibility.

Conclusion- There is need for rigorous training programme for JRs with regular monitoring and supervision. Lack of proper knowledge about BMW management leads to inappropriate waste disposal practices causing further spread of infection in the community.

Keywords: KAP; Questionnaire; BMW rules 2016; JRs.

INTRODUCTION

The past few decades have seen many advances in the field of health care. However, ironically the health care systems that restore and maintain the health in the community are also threatening their wellbeing as there is simultaneous generation of BMW. Hospital waste management is a burning issue nowadays.[1]

BMW means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps.[2-4]

BMW can be categorized into non-hazardous and bio-hazardous. Approximately 75-90% of the biomedical wastes are non-hazardous like any other municipal waste. The remaining 10-25% is hazardous and can be injurious to humans or animals and deleterious to environment.[5]

The waste produced in the course of healthcare activities carries a higher potential for infection and injury than any other type of waste.[6] Improper handling of BMW along with poor infection control practises has led to an increasing incidence of HAI by various pathogens like HIV, Hepatitis B & C virus among health-care providers.[4] It also carries the risk of water, air & soil pollution thereby adversely affecting the environment and community at large. Poor handling practices and inappropriate disposal of

hospital waste is causing an increasing health hazard globally.[7-9] For example, hazardous medical wastes may be handled and disposed of together along with domestic wastes, which in turn will create a health risk for municipal workers, the general public and the environment at large. Since BMW can cause large scale contamination of soil, water and air, Governments across the world have been forced to introduce legal restrains in this area. With a view to control the indiscriminate disposal of hospital waste/biomedical waste, the Ministry of Environment and Forest, Govt. of India has notified the Biomedical Waste (Management and Handling) Rules, 1998 with subsequent amendments (June 2nd 2000, September 2003 and 2011).[4] In order to implement these rules more effectively, these were later superseded by Bio Medical Waste (Management and Handling) Rules, 2016 with subsequent amendments (March 16th 2018).[2,3,10,11]

This rule applies to all those who generate, collect, receive, store, transport, treat, dispose, or handle BMW in any manner. The purpose of BMW management is mainly to reduce waste generation, to ensure its efficient collection, handling with segregation at source into color-coded bags. The Government of India has in fact strongly emphasized on the importance of cleanliness and systemic disposal of all wastes including hospital waste by its launch of the "Swachh Bharat" mission in 2014 with a goal to make India "cleaner and greener" so as to create a better liveable atmosphere.

But lack of awareness and inadequate knowledge regarding BMW management handling rules resulted in hospitals becoming the hub for spreading illness.[11] Most of the earlier studies conducted has mainly emphasized on Bio Medical Waste Management and Handling Rules, 1998.[1, 4-6, 10-18] .With this view of context, the present study was undertaken with the objective to assess the KAP as per latest Bio Medical Waste Management and Handling Rules, 2016 and access the infection control practises among the JRs of Anaesthesiology Department of a tertiary care teaching hospital of North India . This would help to identify gaps in the BMW management practices followed by the junior doctors. This way their future trainings and sensitization programmes can be planned accordingly and necessary steps can be taken for putting the protocols in place.

MATERIALS AND METHODS

Present study was conducted over a period of two years (2018 & 2019) among the 100 JRs of Anaesthesiology Department by administering pre-designed, pretested, self-administered, semi-structured, anonymous questionnaire to them. A questionnaire was designed and pretesting of the same was done for accessing its validity and reliability through a small pilot study. Then, rectification of the questionnaire was done by incorporating necessary changes and structuring was done.

The questionnaire had two parts. First part contained socio-demographic variables such as age, sex, year of residency. The second part consisted of series of questions related to the knowledge, attitude and practice regarding Biomedical Waste and its management as per the latest Bio Medical Waste Management and Handling Rules, 2016 with subsequent amendment in 2018 and Hospital infection control procedures.

Questions to assess knowledge were of multiple choice type with only one correct response. Questions to assess attitude and practice were presented in the positive or negative response format (Yes/No). Each correct and incorrect response in the knowledge section and similarly each yes and no for the attitude and practice question were given 1 and 0 mark respectively. Thus, the maximum score for each section was 10 and minimum zero.

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. The unwilling and absentee were excluded from the study. Then, the questionnaire was administered and they were requested to return the questionnaire immediately after answering. It was assumed that individuals involved in the study would cooperate and give correct information to the best of their knowledge and belief.

KAP of each participant was measured from the corresponding score in different sections of the questionnaire. All the data was collected, compiled and tabulated using Microsoft Excel and subsequently analysed.

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RESULTS

Results were expressed as percentage from the number of participants who answered correctly and were tabulated.

Table 1: Socio-demographic profile of study group

S. No	Variable		Percentage
1.	Age	< 30 year	71
		>30 years	29
2.	Sex	Male	37
		Female	63
3.	Year of residency	1st year JR	46
		2nd year JR	38
		3rd year JR	16

Table 2: Percentage of correct response for questions based on Knowledge regarding bio-medical waste

S. No	Questions regarding Knowledge on biomedical waste management	%
1.	Segregation of waste important at the point of generation itself.	58
2.	Authorization from Pollution control board is required for biomedical waste management.	52
3.	As per biomedical waste management rules 2016, BMW is divided into four coloured categories.	54
4.	In case of needle stick injury PEP regimen should be started ideally within two hours.	55
5.	Both correct colour coding & Bar coding are important for Biomedical waste disposal.	39
6.	Biohazard symbol, Cytotoxic hazard symbol & Bar code need to be put on different colour biomedical waste bags.	55
7.	Expired medicines are disposed in yellow Non- chlorinated plastic bags.	57
8.	Tubing's, IV sets, catheters, urine bags and syringes are disposed in red Non-chlorinated plastic bags.	59
9.	Metallic body implants are disposed in puncture proof and leak proof, blue coloured cardboard boxes.	47
10.	Discarded linen, mattresses, beddings contaminated with blood or body fluid, routine mask and gown are disposed in yellow Non-chlorinated plastic bags.	59

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Table 3: Percentage of positive responses for questions on Attitude regarding biomedical waste

S. No.	Questions regarding attitude on biomedical waste management	%
1.	BMW management is teamwork.	100
2.	BMW management doesn't put extra financial burden for the institute.	32
3.	Regular trainings are useful for Hospital infection control.	100
4.	Segregation of BMW doesn't lead to wastage of crucial time which could otherwise have been utilized for providing better patient care.	28
5.	Would like to attend any training programme in BMW management to enhance knowledge.	100
6.	Biomedical waste management is my own personal responsibility.	100
7.	Have adequate knowledge on BMW management.	61
8.	Will advise my subordinate to follow correct colour coding for waste disposal.	77
9.	Wear PPE in order to decrease risk of contracting infection in the hospital.	100
10.	All needle stick injuries need to be reported timely.	100

Table 4: Percentage of correct responses for questions on Practice regarding biomedical waste

S. No	Questions regarding practice on biomedical waste management	%
1.	Disinfect all liquid biomedical waste prior to disposal/ drainage.	68
2.	Don't store biomedical waste for more than 48 hours.	100
3.	Don't dispose expired medicines in black containers.	68
4.	Don't practice recapping of used needle.	79
5.	Vaccinated against Hepatitis B and Tetanus.	89
6.	Have undergone training in Bio Medical Waste Management.	67
7.	Don't dispose needles, scalpels in puncture proof & leak proof blue coloured cardboard boxes.	66
8.	Don't dispose glass vials and ampoules in white puncture proof & leak proof container.	52
9.	Don't dispose beddings contaminated with blood or body fluid in yellow chlorinated plastic bags.	34
10.	Don't dispose BMW along with municipal waste.	79

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DISCUSSION

Segregation at source, the golden rule of BMW was known by 58% of doctors.(Table 2) Others were unaware that whether it can be done at point of disposal or in fact anywhere. Studies done by Mehta et al,[4] Basu et al,[12] Mathur et al[17] and Malini et al[11] showed that 56.16%, 78.8%, 81.3 % and 98.4 % doctors respectively were aware of it. Segregation at source of different types of bio-medical wastes and their appropriate storage and/or disinfection sterilization, etc. would ensure that infectious wastes do not get mixed with non-infectious wastes which would otherwise infect the entire waste.[5] 48% doctors were not aware that whether authorization for biomedical waste management is required and if required whether it is to be taken from pollution control board or from municipal committee. Pullishery et al[5] reported that 56% participants did not have any knowledge of any authorized hospital waste collection unit in and around Mangalore, Karnataka. Only 54% of doctors knew that that there are four different coloured categories as per BMW rules 2016. A study done in a tertiary care hospital of West Bengal among 200 JRs revealed that only 55.9% doctors knew about 10 different categories of BMW management and handling 1998 rules even though it was in their MBBS curriculum.[12] Only 67% residents agreed that they have undergone training in BMW management. All the JRs were in fact trained and sensitized about the importance of BMW rules 1998 in their undergraduate curriculum.

In this study, 55% of doctors knew that in case of needle stick injury Post exposure prophylaxis (PEP) regimen should be started ideally within two hours for its maximum benefit. A study among doctors at a tertiary care hospital in Western India revealed that 42.46% doctors were aware of it.[4]Only 39% doctors had knowledge that both correct colour coding and bar coding of biomedical waste bags is important. Bar code on bags needs to be scanned at the point of generation in every Health Care Facility (HCF) to detect any pilferage as well as during transportation of waste from HCF to the Common Bio-medical Waste Treatment Facility (CBWTF). This along with global positioning system (GPS) creates real time online monitoring of quantity of waste generated, its proper collection, transportation, treatment and final disposal. About 55% of doctors were aware that biohazard symbol, cytotoxic hazard symbol and bar coding, all were important for different colour waste bags. Basu et al[12] in their study reported that 67.9 % of doctors were aware of bio hazard symbol, indicating urgent need of sensitization programme among them to refresh as well as update their knowledge. A cross-sectional study at Ain Shams University Hospitals, Cairo, Egypt revealed that only 47.3% physicians had knowledge regarding correct identification of biohazard symbol.[7]

About 43% doctors were not aware of correct colour bag to dispose expired medicines. (Table 2) Only 47% knew that metallic body implants are to be disposed in puncture proof and leak proof blue coloured cardboard boxes. 59% doctors had knowledge that Tubing's, IV sets, catheters, urine bags and syringes are to be disposed in red non-chlorinated plastic bags and not in chlorinated plastic bags or yellow non-chlorinated plastic bags. As per BMW 2016 rules, every occupier has to phase out use of chlorinated plastic bags, gloves and blood bags for storing and transporting of BMW. The operator of CBWTF if required, shall supply non-chlorinated plastic coloured bags to the occupier on chargeable basis.[2,3] Similarly, 59% doctors had knowledge that discarded linen, mattresses, beddings contaminated with blood or body fluid, routine mask and gown are to be disposed in yellow non- chlorinated plastic bags and not in red ones or chlorinated plastic bags. Hakim et al [7] in their study mentioned that only 60.9 % and 51.8 % physicians had the knowledge of what exactly is to be disposed in red disposal bags and sharp boxes respectively.

With respect to the attitude, our study revealed that all doctors agreed to the fact that BMW management is teamwork and also their own personal responsibility. (Table 3) Similar findings were reported among doctors in the study done by Malini et al.[11] About 68% respondents felt that BMW management puts extra financial burden for the institute while study by Malini et al[11] reported it to be 44.4% among doctors. All doctors agreed that regular trainings are useful for hospital infection control and that they would like to attend any training programme in BMW management to enhance their knowledge even though 61% of them felt that they have adequate knowledge regarding BMW management. In our study, 72% doctors believed that segregation of BMW leads to wastage of crucial time which could otherwise have been utilized for

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providing better patient care while in study by Malini et al[11] 44.4 % doctors reported the same. On being enquired about the problems being faced by doctors towards proper implementation of BMW rules, the responses obtained were limited man power, lack of strict rules, lack of regular trainings, busy work schedule and lack of team work.

Only 77% doctors agreed that they will advise their subordinate staff to follow correct colour coding for waste disposal. This may be because of their busy work schedule and their lack of confidence that they themselves might not know all aspects of BMW management correctly. There is a need of regular hands on training on updated BMW rules 2016 of in fact all the hospital staff members who are directly or indirectly involved in handling of BMW. This way they won't find it to be an extra burden on them in implementing the same as it will become part of their routine work culture. This will also help boost their overall confidence while simultaneously protecting them and others from spread of HAIs. All doctors felt that wearing personal protective equipment (PPE) decreases risk of contracting infection in hospital. This is in contrast to the study by Hakim et al[7], who pointed that only 55.5% physicians felt that PPE decreases risk of contracting infection. In our study, all doctors felt that needle stick injury is an issue and that all sharp injuries need to be reported timely so that proper corrective and preventive action (CAPA) can be taken without delay but roughly 21% still practise recapping of used needle even when it can be avoided. Mathur et al[17] in their study figured out that 62.6% of doctors agreed reporting of injuries due to improperly disposed sharps.

As per latest BMW rules every occupier has to ensure segregation of liquid chemical waste at source and ensure its pre-treatment or neutralisation prior to discharge into municipal drainage.[2,3] In our study 68% agreed to this practice.(Table 3) About 21% of doctors reported that they dispose BMW along with municipal waste. Pullishery et al[5] showed in their study that 32% participants agreed that they still dump medical waste in corporation bin. This malpractice can have serious consequences as it will lead to contamination of entire municipal waste thereby leading to spread of disease in community. Regular supervision and monitoring is the need of hour.

All doctors agreed that that they don't store BMW for more than 48 hours. Malini et al[11] in their study reported that only 55.6 % doctors were aware that BMW should not be stored for more than 48 hours. Provided that in case for any reason it becomes necessary to store such waste beyond such a period, the occupier of HCF shall take appropriate measures to ensure that the waste does not adversely affect human health and the environment and inform the prescribed authority along with the reasons for doing so.[2,3] In the current study, 89% respondents reported that they are properly vaccinated against both Hepatitis B and Tetanus along with booster doses at recommended intervals to maintain their immune levels. Malini et al[11] in their study showed that 81% doctors were vaccinated against Hepatitis B. Study done by Mehta et al[4] reported that 57.6% participants were vaccinated against both Hepatitis B and Tetanus.

Limitations

The present study was conducted among the JRs of Anaesthesiology Department and did not include the other departments of the institute. Also since it was based on semi-structured questionnaire, every aspect of KAP could not be assessed. Also not much information could be gathered about problems being faced by doctors and their corresponding suggestions in this regard.

Conclusion

Effective management of biomedical waste is not only a legal necessity but also a social responsibility. There is a need of behaviour change communication (BCC) and change in overall mind set at all levels of the healthcare delivery personnel particularly the budding junior doctors who being the future specialists also have an added responsibility of guiding their subordinate staff towards successful implementation of BMW management practises. This will definitely ensure the patient's safety and control of healthcare associated infections.

Recommendation

1. There is a need to conduct periodic hands-on training at regular intervals among resident's particularly junior doctors, regarding all aspects of biomedical waste management and hospital infection control.

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2. Information, education and communication (IEC) materials should be ideally displayed at all critical places and posters and banners regarding Bio Medical waste segregation should be put up at all areas where biomedical waste is generated .

3. Moreover, adequate supplies and equipment for waste management and infection control procedures should be readily available in all departments of the hospital.

4. Regular surveillance and monitoring of the infection control practises is needed at each level of waste generation.

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