Original Research Article

Study of knowledge, attitude, and practices of biomedical waste management among healthcare workers in tertiary care government hospital in western Maharashtra

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ABSTRACT

Background: Bio-medical wastes produced in the course of health care activities has a higher potential for infection and injury than any other type of waste among healthcare workers. Studies in India and other developing countries have shown lack of knowledge and poor practice of biomedical waste (BMW) management.
Methods: This was an observational hospital-based cross-sectional study. Study group included 210 healthcare workers, which includes doctors, interns, nursing staff, laboratory technicians, and class IV workers. Study was done by using a semi-structured questionnaire. The data was analysed using Microsoft Excel 2016.
Results: The majority of doctors (92%), interns (90%), nursing staff (93%) had adequate knowledge about BMW management, but lab technicians and class IV workers (70%) had poor knowledge. Among all health care workers (HCW), 50% of HCW attended the training for biomedical waste management, 46% of the HCW thought that BMW management is an extra burden on work. Except for nursing staff (100%), other healthcare workers (>55%) do not follow the color-coding of BMW.
Conclusions: The study emphasizes the need to conduct periodic training among all healthcare workers about all aspects related to bio-medical waste management.

Keywords: Attitude, Bio-medical waste, Healthcare workers, Knowledge, Practice

INTRODUCTION

Biomedical waste (BMW) includes waste generated during diagnosis, treatment, immunization of human beings or animals or research activities or in production or testing of biologicals.[1] BMW handling rules have been notified in 1998 and updated in March 2016. Health care setting is a major contributor to biomedical wastes.[2,3] BMW management is an integral part of the infection control program and if mismanaged, medical wastes can contaminate the entire environment of the hospital.[4]

BMW management begins from the initial stage of the generation of waste, segregation at the source, storage at the site, disinfection, and transfer to the terminal disposal site; these steps play a critical role in the disposal of waste; these steps play a critical role in the disposal of waste.[1]

A report by (WHO, 2013) states that around 80% of medical waste generated is comparable to the domestic waste while remaining 20% is considered hazardous because it being infectious, toxic or radioactive. Here infectious waste constitutes (15% from all healthcare activities. Pharmaceuticals and chemicals constitute around 3% and the remaining 2% is constituted by heavy metals, genotoxic waste and sharp objects.[2]

The biomedical waste 2004 guidelines of WHO emphasize the importance of "human factor" over

technology and equipment's.[3] Teaching institutes play a critical role in the health care setup as future health-care professionals and caregiver to the community are trained from these places. This includes different trainee, resident doctors, and nursing staff. These technically trained staff has an important role in managing the BMW through their knowledge, attitude, and practices.[1]

Knowledge is defined as the awareness regarding biomedical waste management. Attitude is defined as their feelings towards BMW management. Practice is defined as the identification, segregation and packaging of biomedical wastes.[4]

With this background, this study was conducted with the main objective to assess the knowledge, attitude, and practices of BMW management among the resident doctors, interns, nursing staff, laboratory technician and class IV workers in a tertiary care hospital.

Aim and objectives

To assess the knowledge, attitude and practice of BMW management among healthcare workers.

METHODS

This was an observational descriptive hospital based cross sectional study. Study area was tertiary care hospital and study duration from 1st February 2021 to 10th March 2021. The study sample was taken from convenience sampling methods comprised of 210 health care personals of the hospital including 50 doctors, 90 nursing staff, 50 interns, 20 laboratory technicians and 20 class IV workers.

Inclusion criteria

All healthcare workers were approached and those who were willing to participate, recruited in this study.

Exclusion criteria

Those who were either ill or not responded and/or those who had worked in the hospital for less than a year were excluded from the study.

The tool used for collection of data was a semi-structured questionnaire, which has questions concerning the knowledge, attitude and practices on the subject. The questionnaire comprised of 30 questions, 10 questions each to assess the level of knowledge, attitude and practices respectively of the study participants. A scoring system was devised to categorize knowledge, attitude and practice of the study participants as good, average and poor. A score of <5 was categorized as poor, 5-8 as average and >8 as good.[11] The participants were informed about the purpose of study and consent was taken prior to data collection.

Confidentiality of all the data was maintained. The data was analysed using Microsoft Excel 2016. Chi Square test was used and statistical significance level of the test was expressed as $\alpha=0.05$.

RESULTS

Figure 1 shows that out of 210 healthcare workers, 138 (66%) were females and 72 (34%) were females. Figure 2 shows that among total 210 healthcare workers majority were nursing staff 90 (42.9%), 50 (23.8%) were doctors, 30 (14.3%) were interns, 20 (9.5%) were laboratory technicians and 20 (9.5%) were class IV workers.
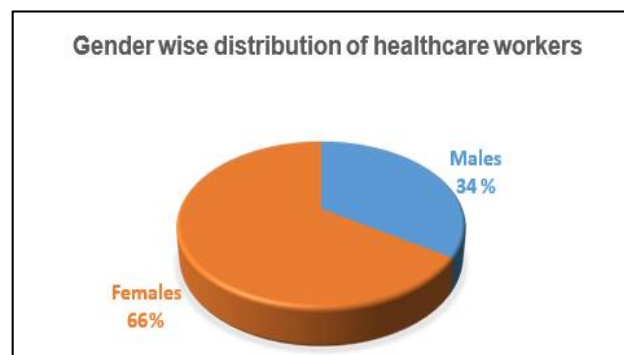

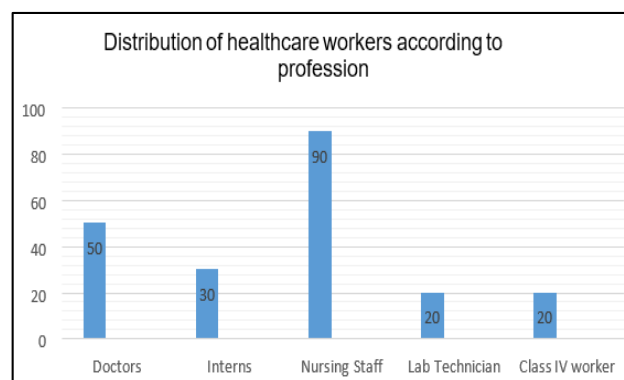**Figure 1: Gender wise distribution of healthcare workers.**

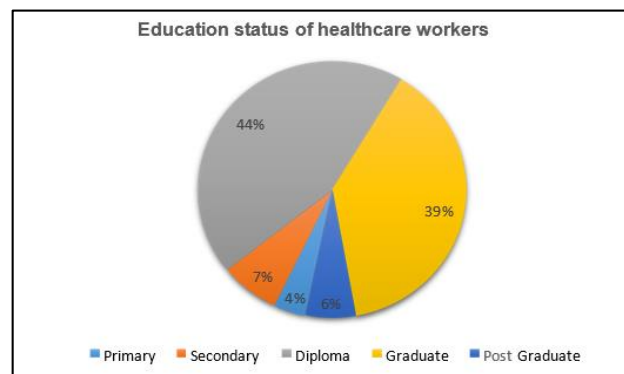**Figure 2: Distribution of healthcare workers according to profession.**

Figure 3: Education status of healthcare workers.

Figure 3 shows most of healthcare workers were educated up to diploma (44%), followed by graduate (39%), up to secondary level (7%), postgraduate (6%) and up to primary level (4%).

Table 1: Correct response for questions on knowledge.

Questions	Doctors (%) (n=50)	Interns (%) (n=30)	Nursing staff (%) (n=90)	Lab technician (%) (n=20)	Class IV worker (%) (n=20)	Total (%)
Meaning of biomedical waste?	50 (100)	29 (96.6)	84 (93.3)	20 (100)	9 (45)	192 (91)
Do you know biohazard symbol?	47 (94)	27 (90)	80 (88.8)	20 (100)	5 (25)	179 (85.2)
Heard about CPCB and MPCB	27 (54)	6 (20)	22 (24)	4 (20)	2 (10)	61 (29)
How biomedical waste should be collected?	49 (98)	29 (96.6)	38 (42.2)	20 (100)	7 (35)	143 (68)
Guidelines of biomedical waste disposal of Government of India	46 (92)	27 (90)	84 (93.33)	9 (45)	3 (15)	169 (80.5)
Sequence of biomedical waste management	49 (98)	24 (80)	60 (66.6)	13 (65)	4 (20)	150 (71.4)
Training for biomedical waste management in your institution?	23 (46)	9 (30)	66 (73)	2 (10)	1 (5)	101 (48)
Approximate quantity of infectious waste among total waste generated from a healthcare facility	20 (40)	7 (23.3)	36 (40)	1 (5)	0 (0)	64 (30.5)
Disease likely to be transmitted while handling bio-medical waste	50 (100)	20 (66.6)	78 (86)	17 (85)	4 (20)	169 (80.5)
Biomedical waste (management and handling) rules were first proposed in:	19 (38)	7 (23.3)	70 (77.7)	2 (10)	3 (15)	101 (48)

χ^2 value =95.11; degrees of freedom = 36; $p<0.001$.

Table 2: Correct response for questions on attitude.

Questions	Doctors (%) (n=50)	Interns (%) (n=30)	Nursing staff (%) (n=90)	Lab technician (%) (n=20)	Class IV worker (%) (n=20)	Total (%)
Do you think that safe management of biomedical waste is an important issue?	49 (98)	28 (93.3)	78 (86.6)	20 (100)	12 (60)	187 (89)
College should organize separate training programme for BM waste management	48 (96)	29 (96.7)	90 (100)	20 (100)	19 (95)	206 (98)
Will you like to attend voluntarily the programme that enhances your knowledge about waste management?	48 (96)	21 (70)	78 (86.6)	20 (100)	19 (95)	186 (88.6)
Do you think there is a need of sterilization of infectious waste by autoclaving before shredding and disposal?	45 (90)	25 (83.3)	37 (41.1)	18 (90)	5 (25)	130 (62)
Do you think need of separate vehicle to transport biomedical waste?	50 (100)	29 (96.7)	89 (98.9)	19 (95)	19 (95)	206 (98)
Do you think that safe management of BMW is an extra burden on work?	33 (66)	17 (56.7)	47 (52.2)	14 (70)	1 (5)	112 (53.3)
Do you think Biomedical waste management can reduce health hazards?	50 (100)	28 (93.3)	78 (86.7)	20 (100)	17 (85)	194 (92.4)
Do you think Waste management is a teamwork?	50 (100)	28 (93.3)	90 (100)	20 (100)	13 (65)	201 (95.7)
Waste management is a part of my responsibility	50 (100)	29 (96.7)	90 (100)	17 (85)	8 (40)	194 (92.4)
Do you know if the hospital must have standard storage room for keeping hospital infectious waste?	34 (68)	19 (63.3)	77 (85.6)	17 (85)	11 (55)	158 (75.2)

χ^2 value =39.08; degrees of freedom = 36; $p<0.05$.

Table 3: Number of correct responses for questions for practice.

Questions	Doctors (%) (n=50)	Interns (%) (n=30)	Nursing staff (%) (n=90)	Lab technician (%) (n=20)	Class IV worker (%) (n=20)	Total (%)
Do you wear personal protective measures while handling biomedical waste	31 (62)	22 (73.3)	87 (96.6)	20 (100)	19 (95)	179 (85)
Do you follow colour coding for biomedical waste?	33 (66)	15 (50)	90 (100)	14 (70)	3 (15)	155 (73.8)
The used disposable plastics (e.g. catheters) are disposed in which bags is:	27 (54)	17 (56.6)	84 (93.3)	12 (60)	7 (35)	147 (70)
How will you dispose expired drugs?	24 (48)	11 (36.6)	37 (41.1)	10 (20)	8 (40)	90 (43)
Do you ensure tying up the waste bag when its 3/4th filled?	34 (68)	24 (80)	89 (98.8)	2 (10)	3 (15)	152 (72.4)
Glassware and metallic body implants are disposed in:	34 (68)	13 (43.3)	82 (91.1)	7 (35)	9 (45)	145 (69)
Infectious sharps and needles are disposed of in:	35 (70)	12 (40)	45 (50)	12 (60)	7 (35)	111 (53)
Infectious biodegradable (human tissue, blood, body fluids, cotton dressing, suture material) are disposed of in	38 (76)	22 (73.3)	87 (96.6)	8 (40)	15 (75)	170 (81)
How you will dispose liquid waste?	42 (84)	28 (93.3)	86 (95.5)	10 (50)	6 (30)	172 (82)
Do you maintain daily register for waste disposal?	27 (54)	11 (36.6)	48 (53.3)	3 (15)	5 (25)	94 (45)

χ^2 value =66.63; degrees of freedom = 32; p<0.001.

Table 1 shows majority (more than 90%) of doctors, interns, nursing staff, and laboratory technicians knew the meaning and symbol of biomedical waste. Doctors and interns (more than 90%) had better knowledge of biomedical waste collection than nursing staff (42%). Except lab technician (45%) and class IV workers (15%), all other healthcare workers had good knowledge about guidelines of biomedical waste. Except Nursing staff (73%), majority all other HCWs had not attended the training of biomedical waste. Only 20% of class IV workers had knowledge about which diseases are transmitted through biomedical waste. Class IV workers mainly collect biomedical waste but only 35% workers knew proper method of waste collection. The differences in knowledge across all the five categories of healthcare workers were statistically significant (p<0.05)

Table 2 shows more than 80% of healthcare workers were of the opinion that biomedical waste is an important issue and more than 95% health care workers wanted training programme in the institute. More than 60% healthcare workers thought that there is a need of sterilization of infectious waste by autoclaving before shredding and disposal. 52% of nursing staff and 70% lab technician said that safe management of BMW is an extra burden on work. More than 95% HCWs thought biomedical waste management is a teamwork. The differences in attitude across all the five categories of healthcare workers were statistically not significant (p>0.05).

Table 3 shows that 40% of interns practice correct disposal of sharps and needles. 50 % of interns and 15%

of class IV workers followed colour coding for bio medical waste. 40% of interns and 35% of lab technicians practice proper disposal of Infectious sharps and needles. Only 6% class workers practice correct dispose liquid waste. The differences in practice across all the five categories of healthcare workers were statistically significant (p<0.05).

Table 4: Assessment regarding overall knowledge attitude and practice in healthcare workers.

Assessment	Knowledge	Attitude	Practice
Good	11.42%	57.61%	18.57%
Average	70%	40.95%	63.80%
Poor	18.58%	1.44%	17.61%

Table 4 shows overall knowledge attitude and practice based on score, it shows majority (70%) of HCWs had average knowledge of biomedical waste management, 57.6% had good attitude and 63.8% had average practice score in biomedical waste management.

DISCUSSION

The healthcare workers had positive attitude towards biomedical waste management rules and its implementation. This is comparable to study done by Verma et al which showed that more than 70% of HCWs have good ideas about biomedical waste management.[3] However in study done by Sekar et al had showed that resident doctors and interns had better understanding of biomedical waste management than other groups and

class IV workers were highly ignorant.[5] Aanandaswamy et al study has shown that nursing staff and technicians have received formal training and doctors received less training.[7] Also their attitude score were more satisfactory than practice and knowledge score. Similar to the study by Bhagawati et al in present study, 71% of the participants knew that the key step is segregation, but 80% of all HCWs did not know how to differentiate infectious from non-infectious waste.[13] Less than 50% of the participants had received training in biomedical waste management, therefore almost all of them wanted regular training programmes to enhance and upgrade their knowledge regarding the topic. Similar findings were noted in study done by Munda et al and Malini et al.[15] Our finding agrees with that of Mathur et al that the lack of formal education among the house-keeping staff might play a factor in low awareness among them.[16] The present study showed that knowledge score was highest in doctors, followed by interns and nursing staff and least in class IV workers, which was similar to the study conducted by Rao et al.[9] Mehta et al in their study showed that knowledge of colour coding is poor among nursing staff, but this study showed they had good knowledge.[11] This study shows that as compared to all other professional categories doctors were found to be better knowledge and attitude regarding biomedical waste, nursing staff were better in their practice; similar results were seen in study done by Ranu et al.[12]

CONCLUSION

In our study, as compared to all other professional categories doctors and interns were found to be have average knowledge but good attitude regarding Biomedical waste, while nursing staff were better in their attitude and practice.

Class IV workers have poor knowledge and practice.

ACKNOWLEDGEMENTS

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