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Research Article

BIOMEDICAL WASTE MANAGEMENT (BMWM) RULES: HAVE WE ADAPTED OURSELVES WITH THE LATEST?

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A B S T R A C T

Introduction. The Biomedical waste (BMW) warrants save disposal as it can act as a potent source of infection. **Objectives.** To assess the knowledge and attitude of hospital staff regarding biomedical waste management (BMWM). **Methodology.** A cross sectional study was conducted on 177 hospital staff including Doctors, Nursing Staff, Laboratory Technicians and Sanitary Staff. Participants were selected using convenient sampling. Questionnaire was used to collect the data. Data was analysed using SPSS 21. **Results.** In current study, 57.8% participants self-declared their knowledge regarding BMWM as "Incomplete". Majority (83.1%) participants claimed that they were "Fully Aware" of colour codes as per latest BMW rules. However, only 45.8% could correctly write new BMW colour codes. Only 57% participants had received training after BMW 2016 rules were announced. 96.6% participants had expressed interest to undergo training in BMWM in future. **Conclusion:** The knowledge and practices regarding BMWM of hospital staff were poor. The hospital must organise regular training sessions on BMWM to educate their staff.

INTRODUCTION

According to Bio-medical waste (Management and Handling) Rules 1998 of India, "Biomedical Waste" (BMW) is defined as "any waste, 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 biologicals" [1,2]. It is important to handle this waste properly as it carries very high potential of causing infection and injuries to healthcare personnel and other humans. Improper handling of BMW can also cause soil, water and air pollution by pathogens. [3] Hence, all Health Care Facilities (HCFs) should ensure appropriate Biomedical Waste Management (BMWM).

This waste can broadly be classified into general waste, non-infectious waste, infectious waste and hazardous waste. Bulk (75-90%) of the waste is comparable to domestic waste and can be managed with municipality waste. But 10-25% of the waste can be hazardous to general community. [2]

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Hence, Bio-medical Waste Management and Handling Rules were first introduced in 1998 to ensure safe disposal of BMW across the country. These rules have been amended time-to-time as to make them more comprehensive, practical, user-friendly and unambiguous for healthcare staff. Recently the new BMWM Rules were introduced in 28th Mar 2016. The latest rules have included all persons and healthcare facilities who generate, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form including hospitals, nursing homes, clinics, dispensaries, animal houses, veterinary institutions, blood banks, pathological laboratories, research or educational institutions, clinical establishments, AYUSH hospitals, medical or surgical camps, health camps, blood donation camps, vaccination camps, first aid rooms of schools, research labs and forensic laboratories. [4]

Hospital staffs play a pivotal role in proper management of BMW provided they are aware of it. Management of BMW involves different healthcare personnel at different stages from its generation, collection, segregation, handling and till it is finally disposed. Various studies have shown that the awareness and practices of Healthcare personnel regarding proper biomedical waste management were poor. [3,5,6]

This study was taken up to assess the knowledge and attitude of hospital staff regarding BMWM as per latest BMW rules.

METHODOLOGY

A cross sectional study was conducted among hospital staff working in Amritsar. Only the hospital staffs dealing with biomedical waste were included in the study. A total of 177 hospital staffs were included in the study which included 42 doctors, 108 nursing staff, 09 Laboratory technicians and 18 sanitary staff. The study was carried between Mar to Apr 2018. Self-administered structured questionnaire (in English, Hindi and local language) was designed which had four major domains, assessment of demographic profile, knowledge and attitude of participants. Knowledge of participants was evaluated regarding "Segregation at source" and "Final Disposal" of 15 selected items viz. Blood stained Bed Sheet, Needles, Patient's Sputum, Placenta, Expired Drugs, Vaccine Vial, Food Remains, Soiled Hand Gloves, Removed Plaster Casts, Blood Stained Gauge Piece, Used Catheters, Patient's Urine, Used Saline Bottles, Patient's Stool and Vomitus. 1 score was given for each correct answer. Hence, a participant can score maximum upto 15 and minimum upto 0 score. Score more than midpoint i.e. > 7.5 out of 15 was considered "Good knowledge" and < 7.5 out of 15 was considered "Poor knowledge". The questionnaire was pilot tested and adjusted for improvements. The data was entered in excel sheet and was analysed using SPSS 21.

RESULTS

As shown in table 1, mean age of participants was 33.48 ± 7.46 years. 72.9% (95% CI = 66.1 – 79.7%) participants were males. Majority 52.5% (95% CI = 45.8 – 59.9) participants belonged to "More than 10 years of Length of service" category.

Table 1 Demographic Variables

S NO	Questions	Frequency	Percentage (%)	95% CI
1	**Gender**			
	• Female	48	27.1	20.3 – 33.9
	• Male	129	72.9	66.1 – 79.7
2	**Education**			
	• 10^{th}	21	11.9	7.3 – 17.5
	• 12^{th}	27	15.3	10.2 – 20.3
	• Diploma Nursing	30	16.9	11.3 – 22.6
	• BSc Nursing	54	30.5	23.7 – 37.3
	• MBBS	24	13.6	9.0 – 18.6
	• MD	21	11.9	7.3 – 16.4
3	**Experience : Years of practice**	51	28.8	22.6 – 35.0
	• ≤ 05 years	93	52.5	45.8 – 59.9
	• > 10 years	33	18.6	12.4 – 23.7
	• > 15 years			
4	**As per Category of Staff**	42	23.7	18.1 – 30.5
	• Doctors	27	15.3	8.5 – 23.2
	• Nursing Staff	30	16.9	11.9 – 22.6
	• Lab Technicians	78	44.1	36.7 – 50.8
	• Sanitary Staff			

All participants had heard the term "Biomedical waste" earlier. The analysis as per category of hospital staff is shown in Table 2.

Table 2 Knowledge and attitude about BMWM in hospital staff

Knowledge and Attitude of Hospital Staff	Doctors	Nursing Staff	Lab Technicians	Sanitary Staff	p Value, (Chi Square Test, df = 3)
Undergone training after announcement of BMW 2016 rules	39 (92.9%)	63 (58.3%)	9 (100%)	12 (66.7%)	0.000
Awareness about announcement year of old BMWM	21 (50%)	30 (27.8%)	6 (66.7%)	0 (0%)	0.000
Awareness about announcement year of New BMWM	25 (59.5%)	32 (29.6%)	5 (55.6%)	3 (16.7%)	0.001
Self-Declared Knowledge of about BMWM as "Complete"	21 (50%)	48 (44.4%)	3 (33.3%)	3 (16.7%)	0.095
Awareness about BMWM Symbol	42 (100%)	9 (100%)	75 (69.4%)	9 (50%)	0.000
Correctly written colour categories for BMW disposal	30 (71.4%)	42 (38.9%)	8 (88.9%)	0 (0%)	0.000
Know that BMW can cause Health Hazards	42 (100%)	105 (97.2%)	9 (100%)	18 (100%)	0.583
Do you play important role in BMWM in your hospital?	27 (64.3)	102 (94.4%)	9 (100%)	15 (83.3%)	0.000
Training after announcement of new BMWM?	39 (92.9%)	47 (43.5%)	9 (100%)	6 (33.3%)	0.000
Noticed poor BMW in your hospital?	27 (64.3%)	54 (50.0%)	3 (33.3%)	6 (33.3%)	0.095
Recommend training for BMWM in future	42 (100%)	102 (94.4%)	9 (100%)	18 (100%)	0.265
Good awareness of Segregation at source of selected 15 BMW items	24 (57.1%)	51 (47.2%)	9 (100%)	3 (16.7%)	0.000
Good awareness about final disposal of selected 15 BMW items	24 (57.1%)	48 (44.4%)	9 (100%)	3 (16.7%)	0.000

The "Self-declared Knowledge" regarding BMWM was revealed to be "Complete" by 50% (n=21) doctors, 44.4% (n=48) Nursing staff, 33.3% (n=3) Lab technicians and 16.7% (n=3) Sanitary Staff. 59.5% (n=25) doctors, 55.6% (n=5) lab technicians, 29.6% (n=32) nursing staff and 16.7% (n=3) sanitary staff were aware of latest BMW rules. The correct year of announcement of latest BMW could be rightly brought out by overall 32.2% (n=57) participants. The most common change cited by the participants in the latest BMW rules in comparison to older rules was "reduction in number of the categories of BMW".

Among all participants, only 49.2% (95% CI 41.8 – 56.5) were aware of "Segregation of BMW at source" of the selected 15 BMW items. Similarly, only 47.5% (95% CI 39.5 – 54.8) were aware of the final disposal of these 15 selected BMW items.

Approximately 83.1% (95% CI = 77.4 – 88.1) had claimed to be "Fully Aware" of colour codes as per latest BMW rules but only 45.8% (95% CI = 39 – 53.1) had written new BMW

colour codes correctly. On category wise analysis, it came out that 88.9% of all Lab technicians followed by 71.4% doctors, 38.8% Nursing Staff and none of the sanitary staff (Chi Square Test, df=3, p=0.000) had written correct colour codes as per latest BMW rules. 76.3% (95% CI = 69.5 – 81.9) of study participants were aware about the biomedical waste symbol.

All participants agreed that proper BMWM is important. Approximately 98% (95% CI = 96.6 – 100) believed that inappropriate BMWM can cause health hazards. 18.6% (95% CI = 13 – 24.9) believed that poor BMWM can cause health hazards to them but majority 79.7% (73.4 - 85.3) agreed that it can also cause health hazards to the patients and the visitors of admitted patients in addition to the healthcare staff working in the hospital. As in Fig 1, Sanitary Staff (74.6%, 95% CI = 67.2 – 80.8) were quoted to be at highest risk of getting health hazards due to poor BMWM. HIV, HBsAg, HCV and Needle prick injury were the most common quoted health hazards caused by poor BMWM.

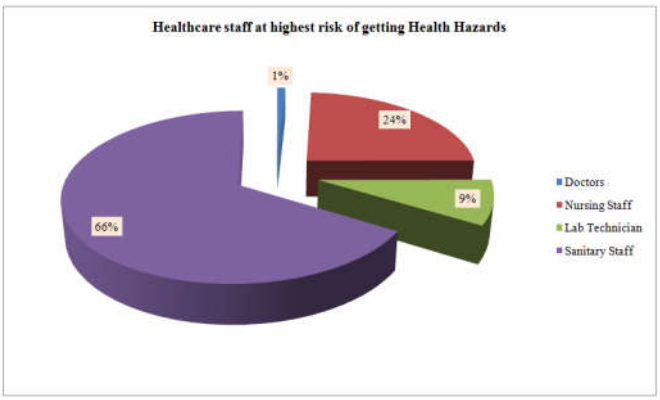

Fig 1 Healthcare staff at highest risk of health hazards

Majority (86%, 95% CI = 81.4 – 91) of them believed that they were "Fully Aware" about the BMWM system of their hospital. Approx 56% (95% CI = 48.6 – 63.3) of them believed that the BMWM system of their hosp was functioning correct. Majority 86.4% (95% CI = 81.4 – 91.5) believed that they play important role in proper BMWM in their hospital. 71% participants correctly knew that the final disposal of BMW of their hospital is taking place inside its premises itself. Around 14% (95% CI = 6.2 – 14.7) had also seen the Incinerator inside their hospital complex. However, Only 2.3% of participants had heard the term "Common Biomedical Waste Treatment Facility".

Majority 88.1% (95% CI = 83.6 – 92.7) participants had received training after joining hospital. However, Only 57% participants had received training after the announcement of BMWM 2016 rules. Among all types of hospital staff, only Lab technicians had undergone training in latest BMW rules after its announcement. As in Fig 2, 96.6% (95% CI = 93.8 – 98.9) participants had shown interest to undergo training in BMWM. "Once a month" (50.8%, 95% CI = 44.1 – 58.2) followed by "Once in a Quarter" (32.2%, 95% CI = 26 – 39) were the most commonly suggested frequency of refresher training on BMWM for the staff.

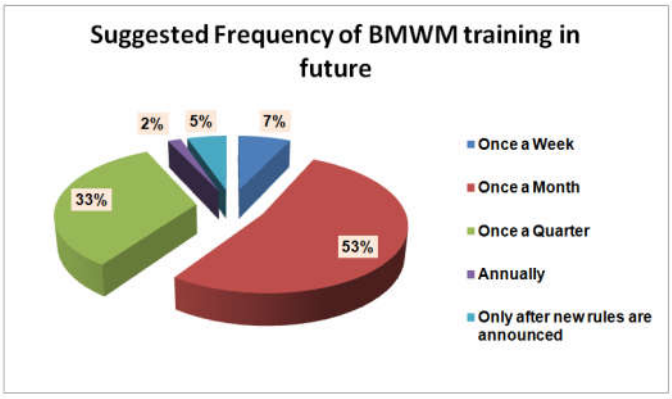

Fig 2 Suggested Frequency of training in BMWM in future

Approximately 24% (95% CI = 17.5 – 19.9) of hospital staff had noticed poor BMWM in the hospital. However, only 6.8% (3.4 – 10.7) have also reported them to the concerned authorities. As in Fig 3, "Poor knowledge about BMWM among staff" (54.2%), "Poor will among Administrators on the issue" (13.9%) and "Multiple amendments of BMW Rules" (11.9%) were the most common barriers perceived by the hospital staff towards poor BMWM.

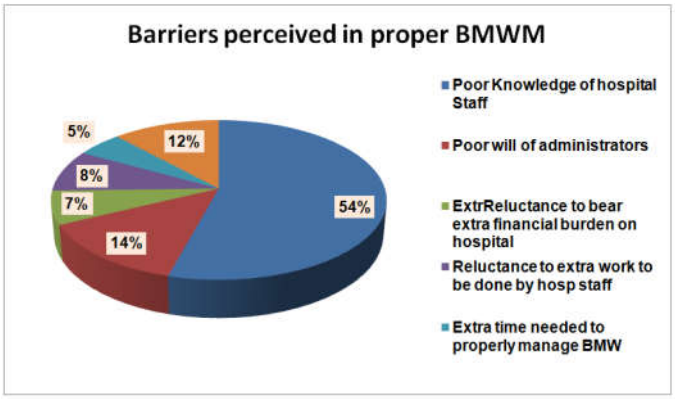

Fig 3 Barriers perceived in proper BMWM

As shown in Table 3, A significant association was found between "the training after announcement of latest BMW rules" with the "Awareness of participants about segregation of selected 15 BMW items" and also with the "Awareness of participants about final disposal of selected 15 BMW items".

Table 3 Association between Awareness regarding segregation and disposal of BMW items and Training after 2016 rules

Awareness	Score	Training after announcement of BMW 2016 rules		P Value df=1, Pearson Chi Square Test
		Yes	No	
Awareness about "Segregation at Source" of 15 selected items	Good (Score > 7.5)	75 (61%)	12 (22.2%)	0.000
	Poor (Score < 7.5)	48 (39%)	42 (77.8%)	
Awareness about "Final disposal" of selected 15 BMW items	Good (Score > 7.5)	75 (61.0%)	9 (16.7%)	0.000
	Poor (Score < 7.5)	48 (39.0%)	45 (83.3%)	

DISCUSSION

The hospital and its staff generate waste while treating and managing their patients. In order to prevent the hazardous effect to hospital staff, general population and the surrounding environment, Biomedical Waste (Management and Handling)

Rules were promulgated in 1998 and later amended in 2016. Health care professionals and auxiliary staff should have adequate knowledge about BMWM for its effective implementation. Hence, a total of 177 hospital staffs of different level of working were studied in this study.

In Rajkot study, majority of the participants had heard about the term "Biomedical waste" while all participants heard about it in this study. [7] In our study, 59.5% doctors, 55.6% lab technicians, 29.6% nursing staff and 16.7% sanitary staff were aware of latest BMWM rules which is lower than awareness of doctors (70%) and Nurses (40%) but higher than that of Lab Technicians (40%) participated in Anand *et al* study. The awareness was similar in our and Anand *et al* study [8]. In Basu *et al* study, higher (94%) participants were aware about them. [9]

In current study, knowledge about correct colour coding as per latest BMWM rules was correct in 45.8% participants. In Madhukumar *et al* study, 96% participants were aware of them while in Deo *et al* study only 20% were aware of it. [10,11] Awareness about biohazard symbol was seen in 76.3% of participants unlike 87.5% in Anand et and 100% in Malini *et al*. [8,12] Knowledge regarding segregation of BMW at source was lowest in sanitary staff which is similar to many studies. [3,9,11,12] Only 57% participants had training on BMWM as in Rajkot study. [7]

CONCLUSION

It is concluded that the knowledge of hospital staff about latest BMWM rules is poor. Only few participants had been trained after the announcement of new BMW rules. Hence, firstly it is recommended that hospital must undertake continuous training of its staff regarding proper BMWM. Secondly, it is also recommended that strict compliance must be ensured by hospital staff which should be strictly monitored by concerned officials continuously.

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