A Study on Assessment of Knowledge, Attitude & Practice (KAP) of Biomedical Waste Management (BMW) among Laboratory Health Care Workers (HCW) in a Tertiary Care Teaching Hospital

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Abstract: *Introduction: Biomedical waste (BMW) management includes segregation, storage, transportation, treatment & disposal of BMW to reduce hazards to HCWs (healthcare workers), community or environment. It is critical that HCWs know the hazards of biomedical waste and make its disposal appropriate. BMW Management is done by Government of India as per 'Bio - Medical Waste Management Rules' 2016. Lack of awareness and inadequate knowledge about BMW management leads to serious health consequences for humans, animals and has an huge negative impact on the environment. Aims & Objectives: To assess & compare knowledge, attitude and practice (KAP) regarding BMW management among HCWs. Material & Methods: A Cross sectional study will be conducted at a tertiary care hospital among Laboratory HCWs. A structured questionnaire based on knowledge & attitude regarding BMW management was given to Laboratory HCWs and data was analysed. To assess the practice of BMW management, BMW audit was conducted at four different BMW segregation sites (Central Laboratory, Sample collection Centre, Microbiology Laboratory, Pathology Laboratory). Results: In this study, when Knowledge of HCWs towards BMW was assessed, it was found upto 93% in Faculty, 85% in Residents & 42% in Lab Technician and Attendants. Whereas, Attitude of HCWs towards BMW management was upto 97% in Faculty, 90% in Residents & 79% in Lab Technician and 71% in Attendants. Practice of HCWs regarding BMW management upto 88% in Central laboratory, 82% in Sample Collection Centre and 64% in Microbiology & 62% in Pathology Laboratory. Conclusion: It is important to convert Knowledge & Attitude into Practice for better BMW management. Knowledge & Attitude was better among Faculties & Residents as they had previous BMW Training while that was not the case for Lab Technician & Attendants. Henceforth, appropriate training programs should be designed for HCWs on BMW management.*

Keywords: Biomedical Waste Management, Knowledge, Attitude, Practice, Healthcare workers

1. Introduction

Healthcare waste stands apart as a distinctive category due to its unique composition, originating sources, hazardous properties, and the imperative for meticulous protection throughout its handling, treatment, and disposal. Mismanagement of this waste not only impacts its generators and operators but also poses significant risks to the wider community.2

Biomedical or healthcare waste is the waste generated by various human and veterinary "Bio - Medical Waste" means 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.1

In developing nations, approximately 1 to 1.5% of the overall municipal waste comprises biomedical waste, with 10 - 15% of this fraction being deemed infectious. According to the World Health Organization (WHO), roughly 85% of hospital waste is categorized as non - hazardous, 10% is infectious, and the remaining 5% is non - infectious yet hazardous.7

In hospitals, a multitude of categories of biomedical waste are generated, emphasizing the critical necessity for segregation at the point of origin, followed by proper disposal into designated bins or bags. Detailed guidelines for this process are outlined by the Ministry of Environment, Forest and Climate Change, Government of India, within the 'Bio - Medical Waste Management Rules'.1

The abundant production and highly contaminating nature of Biomedical Waste (BMW) have perennially raised concerns

regarding its segregation and disposal. Healthcare providers face considerable risks of contracting various infectious diseases during the generation and handling of biomedical waste in hospital settings. Insufficient knowledge among healthcare providers regarding BMW management poses a potential risk factor not only for their own health but also for the broader community and environment.5

Comprehensive knowledge among healthcare employees about biomedical waste management rules and regulations, coupled with their understanding of proper segregation practices, is pivotal for ensuring proficient waste disposal within their respective organizations. Effective management of biomedical waste commences from the earliest stage of waste generation, encompasses segregation at the source, secure storage on - site, thorough disinfection, and culminates in the transfer to the terminal disposal site. Thus, the adequacy of knowledge, attitudes, and practices among healthcare institute staff members holds significant importance in this process.2

Teaching institutes serve as pivotal hubs within the healthcare infrastructure, as they are the primary institutions where future healthcare professionals and individuals involved in community caregiving are trained. These establishments not only impart essential medical knowledge and practical skills but also instill the values and ethics crucial for delivering quality healthcare services. Consequently, the role of teaching institutes extends beyond academic instruction, shaping the caliber and compassion of healthcare providers who will serve and support communities in the future.2

With this background, current study was conducted with the aim to assess and compare the Knowledge, attitude, practices of BMW management among laboratory health care workers (HCW) in a tertiary care teaching hospital.

2. Methodology

Material & Methods: A Cross sectional study will be conducted at a tertiary care hospital among Laboratory HCWs. A structured questionnaire based on knowledge & attitude regarding BMW management was given to Laboratory HCWs and data was analysed. To assess the practice of BMW management, BMW audit was conducted at four different BMW segregation sites (Central Laboratory, Sample collection Centre, Microbiology Laboratory, Pathology Laboratory).

Table 1: Knowledge Questionnaire for BMW Management Assessment

	Knowledge Questionnaire
1	Which of the following is not a waste treatment method for biomedical wastes? A) Incineration B) Autoclaving C) Chemical Disinfection D) Sieving
2	Anatomical waste should be segregated in which colour bags? A) Yellow B) Blue C) Red D) Black
3	Yellow bag contains? A) Incineration Ash B) Human Anatomical waste C) Sharps D) Solid Waste
4	Urine bags should be segregated in which colour bags? A) Yellow B) Blue C) Red D) Black
5	The most suitable disinfectant for decontamination of HIV contaminated endoscope is? A) 10% Sodium Hypochlorite B) 5% phenol C) 2% Gluteraldehyde D) 70% Ethanol
6	Sharps should be segregated in which colour box? A) Yellow B) Blue C) Red D) White
7	Before segregation of microbiological wastes, pre - treatment with what concentration of hypochlorite is recommended? A) 1 - 2% B) 10% C) 5% D) 15%
8	Solid waste (items contaminated with blood and bodily fluids including cotton, dressing) belong to which of biomedical waste? A) Yellow B) Blue C) Red D) White
9	Plastic infectious items should be segregated in which colour bag? A) Yellow B) Red C) Blue D) White
10	Which of the following is not a biomedical waste? A) Animal Waste B) Chemical Waste C) Microbiological Waste D) Domestic Waste

Table 2: Attitude Questionnaire for BMW Management Assessment

Attitude Questionnaire	Agree	Disagree	Can Not Say
Proper BMW segregation and disposal is must for hospital			
Safe BMW management is not an issue at all			
Should BMW be disposed in proper containers?			
Safe BMW management is an extra burden on work and finance on hospital			
College should organize separate classes and programme to upgrade existing knowledge about biomedical waste management			
Will you like to attend voluntarily programmes for BMW management if organized by college?			

**Table 3:** Practice Questionnaire for BMW Management Assessment

Practice Questionnaire (BMW Audit)	Yes	No
Adequate no. of BMW bins or bags as per BMW guidelines		
Displaying of latest guidelines regarding BMW management in different places of hospital		
Adequate no. of puncture proof containers		
Adequate no. of mutilators (needle/syringe cutter)		
Calibrated weighing machines for BMW		
Adequate no. of personal protected equipment (glove, cap, mask)		
1% fresh hypochlorite solution		
BMW record register		
Adequate blood spill management kits		
Adequate post exposure prophylaxis kits		
BMW storage rooms with lock and key		
BMW license under GPCB (Gujarat pollution control board)		
Different forms and formats of needle stick injury		
Is the waste segregated at the site of generation appropriately or not ?		
Is the waste covered in covered bins ?		
Is the bins overfilled ?		
Pre treatment of laboratory waste carried out		

3. Results

This study was conducted among total 136 Health Care Workers (HCW) which includes 30 faculty, 79 Residents, 23 Laboratory Technicians and 4 Attendants.

Table 4: Distribution of HCWs in Tertiary care Hospital

Health Care Workers (HCWs)	
Faculty	30
Residents	79
Lab Technician	23
Attendants	4
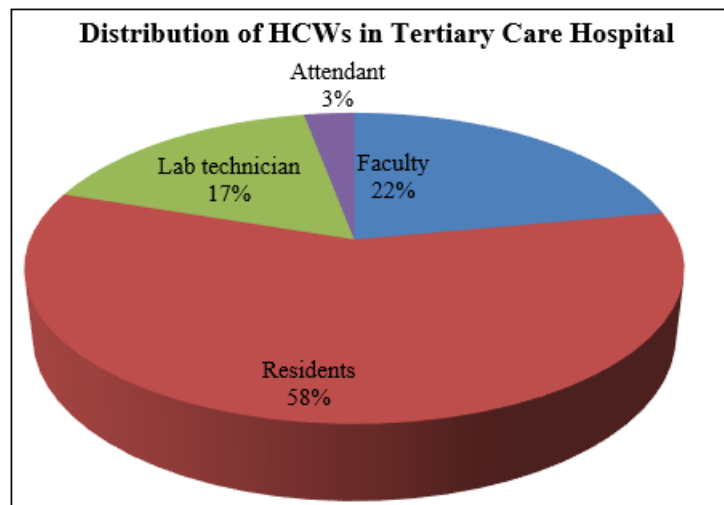
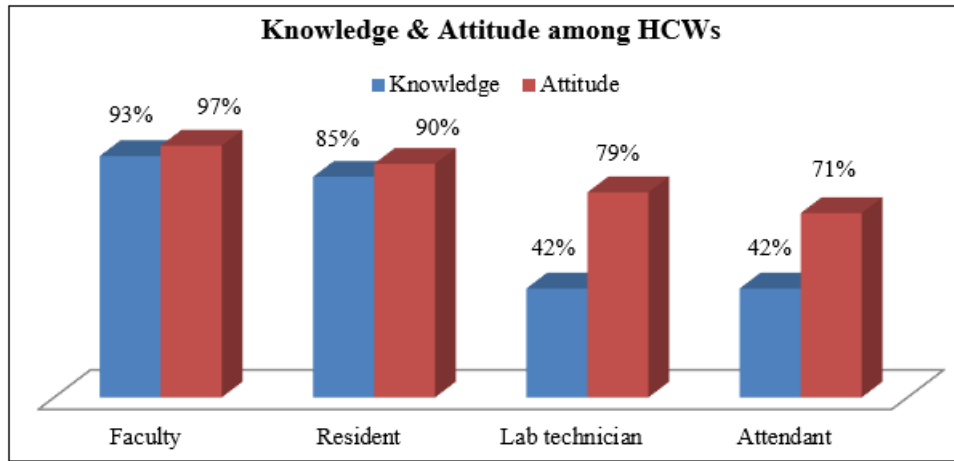**Figure 1:** Distribution of HCWs in Tertiary care Hospital

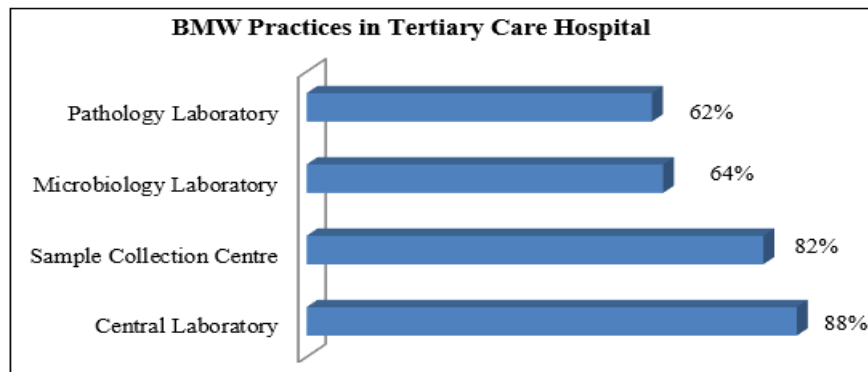**Figure 2:** Knowledge & Attitude among HCWs regarding BMW Management

Figure 3: BMW Practices in Tertiary Care Hospital

When Knowledge of HCWs towards BMW was assessed, it was found upto 93% in Faculty, 85% in Residents & 42% in Lab Technician and Attendants. Whereas, Attitude of HCWs towards BMW management was upto 97% in Faculty, 90% in Residents & 79% in Lab Technician and 71% in Attendants. Practice of HCWs regarding BMW management upto 88% in Central laboratory, 82% in Sample Collection Centre and 64% in Microbiology & 62% in Pathology Laboratory.

Majority of Faculties (90%) & Residents (75%) had received previous BMW training while that was not the case for Lab technician & Attendants.

Table 5: Assessment of Knowledge among HCWs regarding BMW Management

	Knowledge Questionnaire	Faculty	Resident	Lab Tech	Attendant
1	Which of the following is not a waste treatment method for biomedical wastes?	96.67%	81.01%	34.78%	0.00%
2	Anatomical waste should be segregated in which colour bags?	96.67%	93.67%	65.21%	50.00%
3	Yellow bag contains?	93.33%	86.07%	34.78%	75.00%
4	Urine bags should be segregated in which colour bags?	90%	88.61%	47.83%	75.00%
5	The most suitable disinfectant for decontamination of HIV contaminated endoscope is?	93.33%	70.88%	17.39%	25.00%
6	Sharps should be segregated in which colour box?	96.67%	96.20%	60.87%	50.00%
7	Before segregation of microbiological wastes, pre - treatment with what concentration of hypochlorite is recommended?	86.67%	69.92%	39.13%	25.00%
8	Solid waste (items contaminated with blood and bodily fluids including cotton, dressing) belong to which of biomedical waste?	96.67%	87.34%	60.89%	50.00%
9	Plastic infectious items should be segregated in which colour bag?	90.00%	94.93%	39.13%	50.00%
10	Which of the following is not a biomedical waste?	96.67%	89.87%	21.74%	25.00%

Table 6: Assessment of Attitude among HCWs regarding BMW Management

Attitude Questionnaire	Faculty	Resident	Lab Tech	Attendant
Proper BMW segregation and disposal is must for hospital	96.67%	98.73%	95.65%	75%
Safe BMW management is not an issue at all	93.37%	62.02%	47.82%	75%
Should BMW be disposed in proper containers?	100%	100%	100%	100%
Safe BMW management is an extra burden on work and finance on hospital	96.67%	87.34%	100%	50%
College should organize separate classes and programme to upgrade existing knowledge about biomedical waste management	100%	98.73%	65.21%	50%
Will you like to attend voluntarily programmes for BMW management if organized by college?	96.67%	98.73%	69.56%	75%

Table 7: Assessment of Practice among HCWs regarding BMW Management

Practice Questionnaire (BMW Audit)	Central lab	Sample Collection center	Microbiology Lab	Pathology Lab
Calibrated weighing machines for BMW	X	X	X	X
Is the bins overfilled ?	X		X	X
Adequate blood spill management kits			X	X
Adequate post exposure prophylaxis kits		X	X	X
BMW record register			X	X
Adequate no. of mutilators (needle/syringe cutter)			X	X

4. Discussion

In our study maximum participants were residents and then faculty, lab technicians and attendants respectively. In this study, when Knowledge of HCWs towards BMW was assessed, it was found higher Faculty (93%), Residents (85%) & lower in Lab Technician (42%) and Attendants (42%) while we compare with the study RAO et al [2] shows in Faculty (82%), Residents (69%) & Lab Technician (71%) and Attendants (64%).

Attitude of HCWs towards BMW management was found higher in Faculty (97%), Residents (90%), Lab Technician (79%) and Attendants (71%) while we compare with the study RAO et al [2] shows Faculty (79%), Residents (74%) & Lab Technician (71%) and Attendants (63%) had positive attitude.

There is lot to be desired as far as practices regarding BMW management is concerned, in spite of having good level of knowledge and a positive attitude. Most likely reason for this is that in our institution BMW management is stressed upon theoretically in the undergraduate curriculum so most faculty (90%) & residents (75%) had undergone formal training for BMW management while that was not the case for Lab Technicians & Attendants.

5. Conclusion

It is important to convert Knowledge & Attitude into Practice for better BMW management. Knowledge & Attitude was better among Faculties & Residents as they had previous BMW Training while that was not the case for Lab Technician & Attendants.

Hence, it is strongly advised to implement regular and ongoing training sessions, along with periodic retraining, for healthcare providers, encompassing comprehensive guidance on onsite Biomedical Waste (BMW) handling. This approach is essential to ensure the adoption of appropriate BMW management practices and disposal techniques, thereby mitigating the potential hazards associated with BMW and minimizing their adverse effects.5

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