Original Research

Study of Knowledge, Attitude and Practices of Biomedical Waste Management among Medical Nursing Students and Health Care Staff in Hospital

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Abstract
Background: The Government of India implemented medical waste management rules in 1998 to address the environmental burden and potential risks associated with hazardous biomedical waste. This study aims to assess the knowledge, attitude, and practices of biomedical waste management among medical, nursing students, and healthcare staff in a tertiary care hospital. **Methodology-** The study included 430 participants, including medical students, nursing students, sanitary workers, nursing staff, and doctors. The majority of healthcare personnel were trained in biomedical waste management, but training was lacking for sanitary staff and lab technicians. Only 18% of the participants were aware of the origins of the Biomedical Waste Act. Nurses and doctors had the highest levels of knowledge, followed by nursing and medical students. **Result-** Among all the healthcare workers, doctors (100%) and medical students (90%) had better awareness regarding the effects of improper disposal of BMW. **Conclusion-** Biomedical waste management practice was not up to the mark among healthcare workers which increases the risk of transmission of diseases. Therefore, it was determined that it is better to provide in-service training programs on biomedical waste management and upgrade the educational level for healthcare professionals.
Keywords- BMW, management, biomedical, health care, knowledge.

Introduction
Medical waste management rules were promoted by the Government of India in 1998 and came into effect in January 2023. The amount of Biomedical Waste production ranges from 1-2 kg /bed/day in developing countries. 10-20% is estimated to be hazardous waste which has the potential to injure, infect or harm patients, visitors, health care personnel and the public. Hazardous Biomedical waste is an environmental burden and the other important risk is problems encountered by individuals who handle the waste. Biomedical waste management begins from the initial stage of generation of waste, segregation at the source, storage at the site, disinfection and transfer to the terminal disposal site plays a critical role in the disposal of waste. Therefore, adequate knowledge, attitudes and practices of the health care institutes play a very important role. Teaching institutes play a critical role in the health care setup as it is from these places that the future health care professionals and all those persons involved in the caregiving to the community are trained. [1] Biomedical waste has a higher potential for infections and injuries. In an endeavour to reduce health problems, it is essential to have a safe and reliable method of segregation and disposal of hospital waste.[2] Bio-medical waste management is a vital issue not only to hospitals but also to the environment, law enforcement agencies,

media and the general public. The objectives of the other relevant study were to find out the level of knowledge, attitude and practices of health care workers (HCWs) about bio-medical waste management in a rural hospital in Delhi. A pre-designed, pretested, structured questionnaire was administered to 155 HCWs of the hospital. A total of 155 HCWs were selected. The majority of HCWs were in the age group of 30.3 years±5.6 (mean age ± SD) Almost half (54.2%) of the study population comprised female. Most of them were nursing staff. The majority of HCWs in this study took education up to senior secondary and they possess respective professional qualifications. Almost all (97.4%) HCWs were aware of bio-medical waste management rules and have a very positive attitude. The practice of HCWs regarding bio-medical waste management was relatively poor. Nursing staff have not only the best knowledge and attitude but also good practices among all HCWs. Additional training was required for Paramedics and Group-D workers. [3] Bio-medical waste is perilous and can be a health hazard. Medical, dental and nursing graduates spend maximum time during their clinical posting with the patients which increases their chance of exposure and risk related to biomedical waste. Therefore, they need to be aware of biomedical waste management. [4]Health care workers (HCWs) are constantly associated with generation, segregation and disposal of biomedical wastes (BMW). Knowledge, attitude and practice (KAP) of BMW management among HCWs are the three determinants used to evaluate the effective functioning of the BMW management system of the Institution. [5]Hospitals are the centre of cure and also the important centre of infectious waste generation. Effective management of Biomedical Waste (BMW) is not only a legal necessity but also a social responsibility. A study was conducted to assess the knowledge and practice in managing the biomedical wastes at RIMS, Ranchi. It was found that staff nurses had relatively better practice regarding BMW management than students. Though the overall knowledge of study participants was good still they need good quality training to improve their current knowledge about BMW. [6]The amount of biomedical waste being generated in our country is increasing day

by day. Biomedical waste if not handled properly can pollute the environment and can spread many harmful diseases. Healthcare workers in our country are stil not fully aware of proper BMW handling and disposal, despite increasing global awareness of it. [7]Therefore, the above study was conducted to assess the Knowledge, Attitude and Pratices of Biomedical Waste Management among Medical Nursing Students and Health Care Staff in Tertiary Hospital in Prakasam District, Andhra Pradesh.

Materials And Methods
Study place
The study was conducted at the Government General Hospital Ongole, Prakasam District, Andhra
Pradesh for a period of 3 months. (April 2023-June 2023)

Study design
Hospital-based Cross-sectional study.

Inclusion criteria
All the Medical Students, Nursing Students, Sanitary workers, Nursing Staff, Lab technicians and Doctors in GGH Ongole.

Exclusion criteria
All the non-medical staff from GGH Ongole.

Sample size
430 (Nursing Students-100, Medical Students-110, Nursing Staff-100, Doctors-50, Sanitary Staff- 50, lab technicians -20).

Data analysis
Structured Proforma cum Questionnaire was used to obtain the information.

Ethical considerations
Necessary ethical permissions were obtained from the Institutional Ethics Committee before beginning the study.Data collection was done by interviewing Medical Students,Nursing Students, Sanitary workers, Nursing Staff, Lab technicians and Doctors from the hospital. Data was entered into Microsoft excel using SPSS 21. version in the form of tables.
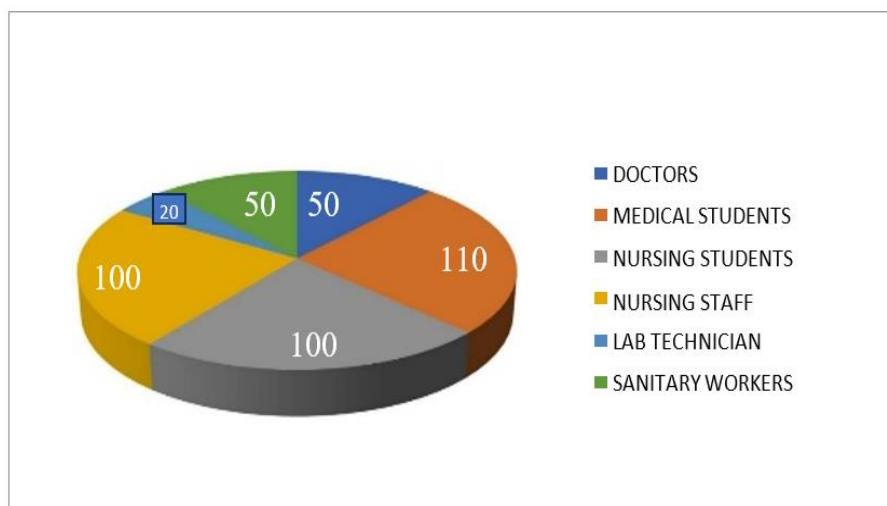
Result

Figure 1: Number of health care workers participating in the study

Table 1: Training among the health care workers regarding the Biomedical Waste Management in GGH, Ongole

QUESTION	YES	NO	DON'T KNOW
1) Training received for Biomedical Waste Management	340(79.06%)	90(20.94%)	0(0%)
2) Is there any existing rule oract for BMW?	350(81.39%)	70(16.27%)	10(2.32%)
3) Do you know about colourcoding available for BMW?	370(86.04%)	60(13.95%)	0(0%)
4) Are you aware of the steps ofhand washing?	340(79.06%)	50(11.62%)	40(9.30%)
5) Do you know about theincinerator?	320(74.41%)	110(25.58%)	0(0%)
6) Do u know about the biomedical hazard symbol	250(58.13%)	50(11.62%)	130(30.23%)
7) Diseases spread bybiomedical waste?	390(90.69%)	40(9.32%)	0(0%)
8) Do u know about fluid spill management	260(60.46%)	160(37.20%)	10(2.32%)
9) Are you aware of the different categories of BMW generated?	340(79.06%)	90(20.93%)	0(0%)
10) Are you aware of the methods of BMW disposal?	230(53.48%)	200(46.51%)	0(0%)

Table 2: Knowledge among the health care workers regarding the Biomedical Waste Management in GGH, Ongole

QUESTION	CORRECT		INCORRECT		DON'TKNOW	
11) For how many years the BMWrule was enacted?	80	18.60%	90	(20.93%)	260	60.46%
12) Anatomical waste must be disposed into which colour bag?	280	65.11%	30	(6.97%)	120	27.90%
13) Sharps must be disposed intowhich colour bag?	270	62.79%	180	41.86%	70	16.27%
14) Into which colour bag the Infectious waste is disposed of?	180	41.86%	110	25.58%	50	11.62%
15) Up to which level the trashbag can be filled?	70	16.27%	25	5.81%	335	77.90%
16) PPE includes?	200	46.51%	120	27.90%	110	25.58%
17) Percentage of infectiouswaste in hospitals?	150	34.88%	160	37.20%	120	27.90%
18) What is the maximum storagetime	35	8.14%	175	40.69%	220	51.06%

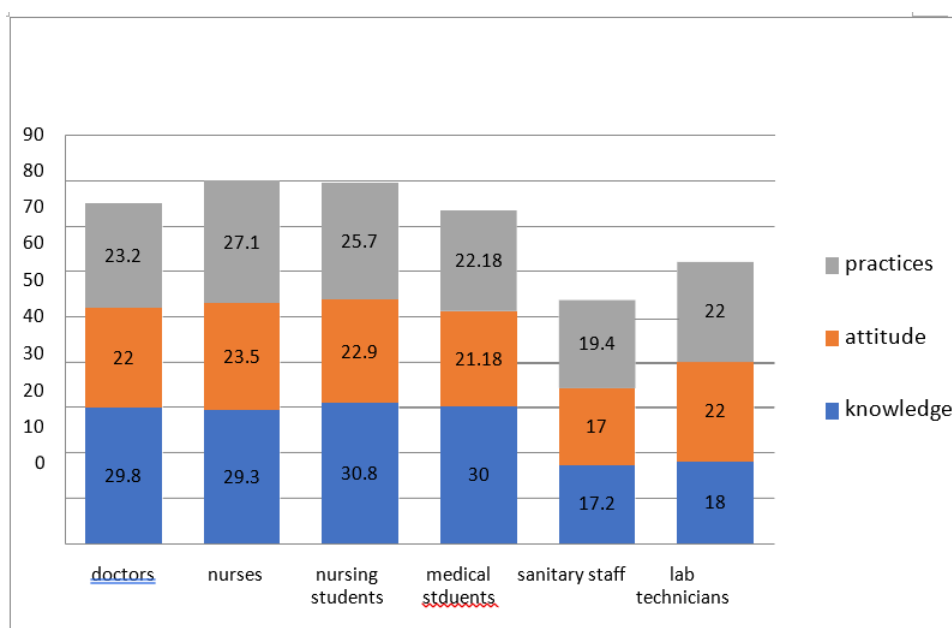|						
of bio-medical waste?						
19) Diseases spread bybiomedical waste?	390	90.69%	0	0	40	9.30%

Figure 2: Knowledge attitude and practices of various health care workers towards BMW management

Table 3: The attitude of the healthcare workers regarding the Biomedical Waste Management in GGH, Ongole

QUESTIONS	YES		NO		DON'T KNOW	
	N (430)	Frequency%	N (430)	Frequency%	N (430)	Frequency%
Is there any necessity for BMW management rules?	380	88.37%	40	9.3%	10	2.3%
Do you think that BMW is compulsory needed for health care delivery?	390	90.69%	10	2.3%	30	6.97%
Will you advice your subordinates to follow color coding for waste disposal?	410	95.34%	20	4.6%	0	0
Will you inform the sanitary staff to transport the waste once the bag is full?	330	76.74%	62	14.41%	38	8.83%
Do you think your knowledge regarding BMW management is adequate	220	51.06%	176	40.93%	34	7.90%
Do you think any further training is required on BMW management?	410	95.34%	20	4.6%	0	0
Do you suggest the segregation of waste at the source itself	410	95.34%	20	4.6%	0	0
Safe management increases the	260	60.46%	170	39.53%	0	0

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financial burden of hospitals.						
Do you think the segregation and management of BMW is an extra burden of work?	140	32.55%	28	6.51%	262	60.93%
Do you think the occupational safety of waste handlers is a must?	420	97.67%	10	2.3%	0	0
Post-exposure prophylaxis must be initiated as soon as possible	322	74.88%	106	24.65%	2	0.46%
Do you think setting up of BMW treatment plant is necessary?	254	59.06%	168	39.06%	8	1.86%
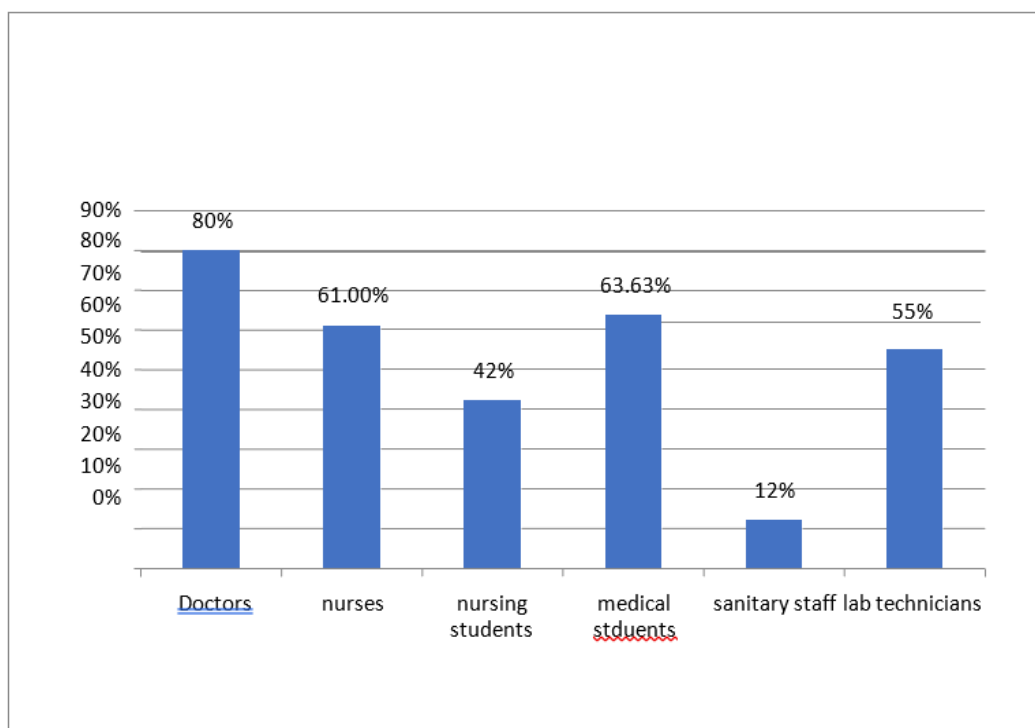
Figure 3: Awareness regarding methods of disposal among health care workers regarding Biomedical Waste Management
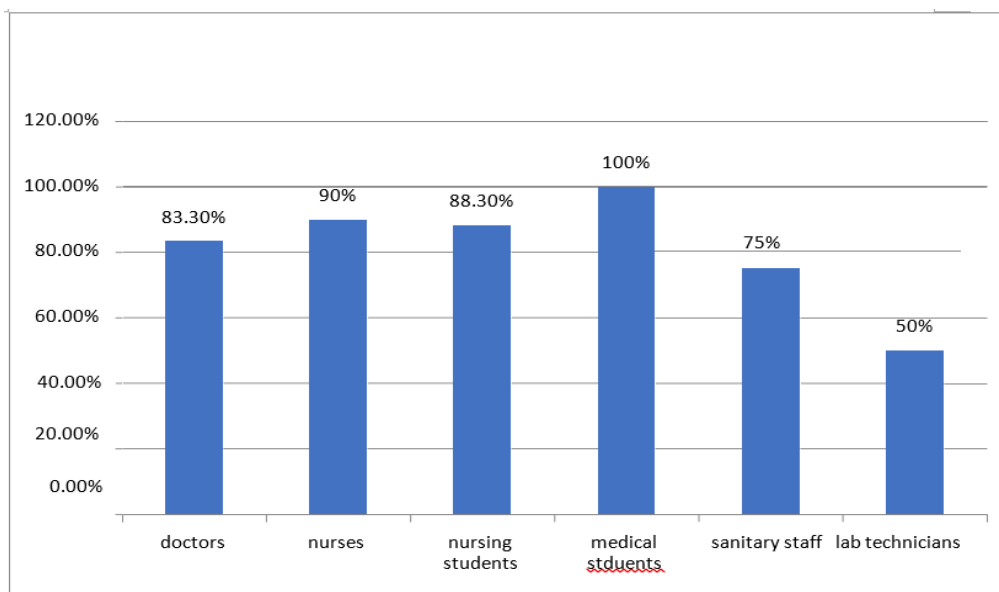
Figure 4: Awareness regarding disposal of various types of waste among health careworkers
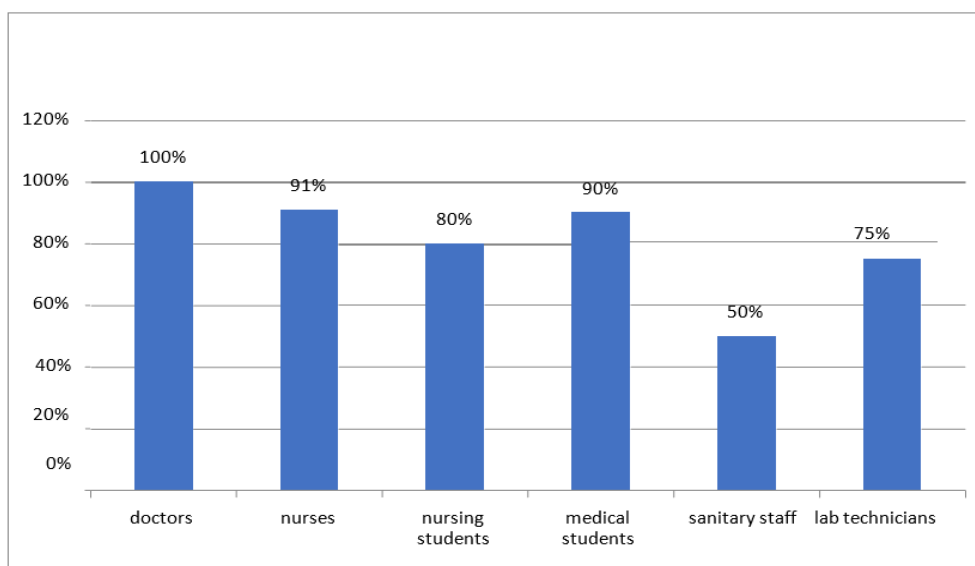

Figure 5: Awareness regarding effects of improper disposal of Biomedical waste among health care-workers

Table 4: Practices among the health care workers regarding the Biomedical Waste Management in GGH, Ongole

QUESTIONS	YES		NO	
	N (430)	Frequency%	N (430)	Frequency%
1) Are you using PPE while handlinglinen?	124	28.8	306	71.2
2) Are you practicing hand hygienebetween every activity?	382	88.8	48	11.2
3) Are you using a sharps destructor/destroyer?	34	7.9	396	43.1
4) Are you using colour-coding bagsfor waste disposal?	366	85.2	64	14.8
5) Are you deposing the waste oncethe bag is full?	348	81	82	19
6) Is using Institute Tied up with anywaste disposal agency?	339	79	91	21
7) Are you maintaining BMW recordsat the	200	46.5	230	23.5

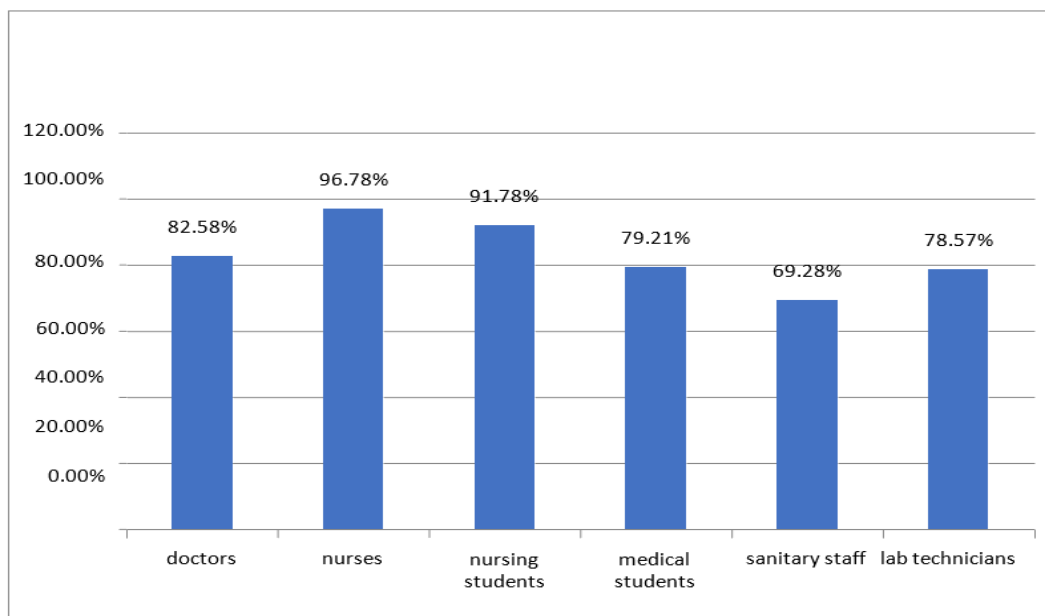|				
workplace?				
8) Are you vaccinated against tetanus	293	68.2	137	31.8
9) Are you vaccinated againstHepatitis B?	276	64.2	154	35.8
10) Are you practicing the correctmethod for collecting				
a. Non-infectious waste	162	37.6	268	62.4
b. soiled	200	46.5	230	53.5
c. anatomical	144	33.5	286	66.5
d. infected plastics	156	36.3	274	63.7
e. Sharps	228	53.1	202	46.9

Figure 6: Practices followed by various healthcare workers during waste disposa

Discussion

In the above conducted study, out of the 430 healthcare workers who participated in the study, 110 were medical students, 100 were nursing staff & 100 were nursing students, 50 were doctors& 50 were sanitary workers, 20 were lab technicians. The majority (79.06%) of the healthcare personnel were trained regarding BMW rules, 86.04% were aware of colour coding, 79.06% were aware of steps of handwashing, 74.14% were aware of an incinerator, 58.13% were aware of biohazard symbol, 90.69% were aware that BMW spreads diseases, 60.46% were aware of fluid spill management, 79.06% were aware of categories of BMW, 53.48%were aware of methods of BMW disposal.Doctors, nurses and nursing students had received training for biomedical waste management, but no such training was given for sanitary staff and lab technicians. Although 79% were aware that there are existing rules for biomedical waste disposal,only 18% were aware of the origins of the Biomedical Waste Act. In the above study, 100% of nurses and doctors had high knowledge. 90% of nursing students and medical students, 65% of lab technicians and 40% of the sanitary staff had high knowledge.Regarding attitude towards biomedical waste, 97.91% of nurses, 91.66% of doctors, 95.41% of nursing students, 88.25% of medical students, 70.83% of lab technicians and 91.66% of the sanitary staff has a positive attitude. Among various healthcare workers, the practices of biomedical waste management were good in 95% of nurses followed by 88% nursing students,82% doctors,79% of medical students ,79% of lab technicians and 70% of the sanitary staff follow good practices. Among all healthcare workers, doctors (80%) have a better awareness of BMW management than the rest. Among all healthcare workers, medical students (100%) had better awarenessregarding the disposal of various types of BMW than others. Among all the healthcare workers, doctors (100%) and medical students (90%) had better awareness regarding the effects of improper disposal of BMW.

Conclusion

Biomedical waste management practice was not up to the mark among healthcare workers which increases the risk of transmission of diseases. The level of education,training on biomedical waste management, availability of bins and the attitude of healthcare workers were found to have significant associations with biomedical waste management practices. Therefore, it was determined that it is better to

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provide in-service training programs on biomedical waste management and upgrade the educational level for healthcare professionals by the regional health bureau and city administration health departments as well as it is recommended to implement a bin system in the hospitals. Finally, all the government and private hospitals should acknowledge the healthcare worker's practice of good biomedical waste management.

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