

KNOWLEDGE, ATTITUDE AND PRACTICES ABOUT BIOMEDICAL WASTE MANAGEMENT AMONG NURSING STAFF IN A TERTIARY CARE HOSPITAL

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Abstract

Background: Biomedical waste/ hospital waste is 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. Hospital-acquired infections have been estimated at 10% of all life-threatening diseases in the South-East Asia region and have been identified as one of the indicators for the management of waste. Although there is increased global awareness among health care professionals about hazards and also appropriate management techniques, the level of awareness in India has been found to be unsatisfactory. **Materials and Methods:** The hospital based cross sectional study was carried out in Anil Neerukonda Hospital, Visakhapatnam. All the nursing staff (n=145) who studied either GNM and B.Sc.(N)course were included in this study. **Results & Conclusion:** Majority of the nurses belonged to the age group of 20-25 years. 89.7% nurses attended orientation training program on BMW. Overall, the knowledge, attitudes and practices towards biomedical waste management among the study respondents was satisfactory. Knowledge, attitudes and practices toward biomedical waste management were better among the nursing staff. Periodic assessment and regular teaching along with hands-on training programs with an emphasis on recent amendments in rules should be stressed to bridge the gap between knowledge, attitude, and practices.

INTRODUCTION

Biomedical waste/ hospital waste is 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] It includes wastes of medical or laboratory origin (e.g., packaging, unused bandages, infusion kits, etc.), as well research laboratory waste containing biomolecules or organisms.^[1] In the 1980s and 1990s, concerns about exposure to human immunodeficiency virus (HIV) and hepatitis B virus (HBV) led to questions about potential risks inherent in medical waste. Thus, hospital waste generation has become a prime concern due to its multidimensional ramifications as a risk factor to the health of patients, hospital staff and extending beyond the boundaries of the medical establishment to the general population.^[2,3]

Although very little disease transmission from medical waste has been documented, both the American Dental Association (ADA) and Centre for Disease Control recommend that medical waste

disposal must be carried out in accordance with regulation.^[4] Hospital-acquired infections have been estimated at 10% of all life-threatening diseases in the South-East Asia region and have been identified as one of the indicators for the management of waste.^[5] World Health Organisation (WHO) reported a 50% re-use in India of syringes and needles that are meant for single use.⁶ Introduction of laws is not sufficient for proper disposal of BM waste.^[6]

The awareness of these laws among the general public as well as development of policies and enforcement that respect those laws are essential.^[7] Although there is increased global awareness among health care professionals about hazards and also appropriate management techniques, the level of awareness in India has been found to be unsatisfactory.^[8-10]

Objectives

- To assess the knowledge regarding biomedical waste management among nursing staff.
- To study the attitude of the nurses towards biomedical waste management.

- To study the practices adopted by the nursing staff regarding biomedical waste management.

MATERIALS AND METHODS

The hospital based cross sectional study was carried out in Anil Neerukonda Hospital, Visakhapatnam. All the nursing staff (n=145) who studied either GNM and B.Sc.(N)course were included in this study.

The instrument is a vehicle that could best obtain pertinent data to the study and at the same time adds to the body of knowledge in the discipline. Based on the study objectives, the instrument was divided into 4 sections

Section A: Demographic data

Section B: Knowledge questionnaire (structured interview schedule).

Section C: Likert's five-point attitude scale (structured interview schedule).

Section D: Observational check list

A structured interview schedule was made to assess the knowledge and attitude and observational checklist was used for assessing the practices regarding biomedical waste management.

Permission was obtained from the institutional ethical committee of NRI Institute of Medical Sciences, Visakhapatnam. Permission was obtained from Medical & Nursing Superintendents of NRI Institute of Medical Sciences, Visakhapatnam. Consent was obtained from the study subjects.

Data entry was done using M.S. Excel and was statistically analysed using Statistical package for social sciences (SPSS Version 16) for M.S Windows. Descriptive statistical analysis was carried out to explore the distribution of several

categorical and quantitative variables. Categorical variables were summarized with n (%). All results was presented in tabular form and are also shown graphically using bar diagram or pie diagram as appropriate.

Operational definitions:

- Knowledge:** The level of awareness and understanding of nurses about biomedical waste management.
- Attitude:** The specific view or opinion or behaviour of nurses regarding biomedical waste management.
- Practices:** The level of utility of resources related to biomedical waste management.
- Nurses:** Individuals who are professionally trained and are providing health care services to the client in health care institutions and in the community.

RESULTS

Majority of the nurses belonged to the age group of 20-25 years (60%) followed by 26-30 years (30.3%), 31-35 years (8.3%) and 36-40 years (1.4%). Males were 13.1% and females were 86.9%. Total years of experience was < 5 years in 76.6% nurses, 6-10 years in 22.1% nurses & 11-15 years in 1.4% nurses. Professional qualification was B.SC Nursing in 55.2% nurses & general nursing and midwifery in 44.8% nurses. Designation was head nurse in 22.1% nurses & staff nurse in 77.9% nurses. 89.7% nurses attended orientation training program on BMW. Majority of the nurses involved in this study were working in wards (40.7%) followed by casualty (17.9%), ICU (17.9%), OT (15.2%) and OP (8.3%).

Table 1: Distribution of nurses based on the knowledge regarding biomedical waste management

Sl.no	Question	Correct		Incorrect	
		n	%	n	%
1.	What is biomedical waste?	143	98.6	2	1.4
2.	What is the symbol of biohazard?	145	100	0	0.0
3.	What is the major classification of waste?	93	64.1	7	35.9
4.	How the cytotoxic waste is generated?	70	48.3	75	51.7
5.	Why segregation of the waste is important?	106	73.1	39	26.9
6.	What is the ideal bin to dispose the waste?	107	73.8	38	26.2
7.	Which type of waste is collected in Red container with biohazard symbol?	130	89.7	15	10.3
8.	Which colour coded bin with biohazard symbol is used for anatomical and pathological waste?	117	80.7	28	19.3
9.	Which colour coded bin with biohazard symbol is used for disposal of glass items?	101	69.7	44	30.3
10.	Which colour coded bin with biohazard symbol is used for official type of waste?	92	63.5	53	36.5
11.	Which type of waste is discarded in green container with biohazard symbol?	97	66.9	47	33.1
12.	How will you discard the sharp materials?	122	84.1	22	15.9
13.	What is your responsibility if mixing of waste with yellow container?	77	53.1	68	46.9
14.	When the cover in the waste colour container has to be tied?	86	59.3	59	40.7
15.	How long the waste can be stored in hospital?	105	72.4	40	27.6
16.	Which route is preferred for transport of waste inside the hospital?	109	75.2	36	24.8
17.	What is the important aspect to be seen in the waste transport vehicle?	128	88.3	17	11.7
18.	What is the importance of shredding in waste disposal?	52	35.9	93	64.1
19.	Why autoclaving is important before disposal of syringes, tubes and gloves?	122	84.1	23	15.9
20.	What is pulverization?	102	70.3	43	29.7
21.	How the placenta is disposed?	56	38.6	89	61.4
22.	Which one should not be incinerated?	92	63.4	53	36.6
23.	How the incinerated ash is stored?	69	47.6	76	52.4
24.	Which type of waste should not be discharged into sewers?	117	80.7	28	19.3
25.	Which is the useful method for final disposal of liquid waste in rural and small health care institutions?	71	49	74	51

26.	Which is the most satisfactory method for disposal of garbage?	61	42.1	84	57.9
27.	What is the important aspect to be considered while purchasing incinerator	103	71	42	29
28.	Which is the prescribed authority for Biomedical waste management?	78	53.8	67	46.2
29.	If biomedical waste management rules are violated, what punishment will be given?	107	73.8	38	26.2
30.	How does the biomedical waste management committee can reduce the wrong way of disposal in colour containers?	71	49	74	51

Table 2: Distribution of nurses based on the attitude regarding biomedical waste management

Sl No	Question	Strongly agree		Agree		Undecided		Disagree		Strongly disagree	
		n	%	n	%	n	%	n	%	n	%
1.	If health team members are effectively implementing necessary measures in biomedical waste management, the incidence of illness will be reduced	102	70.3	43	29.7	-	-	-	-	-	-
2.	The nurses and other health team members should be given training on biomedical waste management	91	62.8	47	32.4	4	2.8	3	2.1	-	-
3.	Single person cannot regulate the proper waste management	68	46.9	53	36.6	10	6.9	14	9.7	-	-
4.	Periodical classes and demonstration of biomedical waste management is necessary for upgrading the knowledge of nursing staffs	79	54.5	53	36.6	12	8.3	1	0.7	-	-
5.	Introducing biomedical waste management unit in to the nursing curriculum will bring out effective management of biomedical waste management in the working areas in future	68	46.9	58	40	16	11	3	2.1	-	-
6.	To safeguard the rag pickers, government must formulate and regulate necessary rules & regulations and implement steps effectively	61	42.1	76	52.4	7	4.8	1	0.7	-	-
7.	Labelling over the waste will reduce confusion	86	59.3	47	32.4	3	2.1	9	6.2	-	-
8.	It is difficult to reduce the amount of waste produced in the hospital	72	49.7	52	35.9	13	9	7	4.8	-	-
9.	More colour containers may leads to mismanagement	49	33.8	67	46.2	17	11.7	12	8.3	-	-
10.	It is difficult to identify and categorize the waste	48	33.1	48	33.1	19	13.1	26	17.9	2	1.4
11.	Busy schedule may interfere with the disposal of waste	43	29.7	63	43.4	31	21.4	6	4.1	1	0.7
12.	Biomedical waste management is time consuming process	52	35.9	61	42.1	19	13.1	13	9	-	-
13.	Biomedical waste management needs more of expenditure	55	37.9	54	37.2	23	15.9	13	9	-	-
14.	It is difficult for the nurse to co-ordinate with other health team members in biomedical waste management because of positional hierarchy	47	32.4	60	41.4	28	19.3	9	6.2	-	-

Table 3: Distribution of nurses based on the practices regarding biomedical waste management

Sl.no	Question	YES		NO	
		n	%	n	%
1.	Identifying and labelling infectious and non- infectious waste	138	95.2	6	4.1
2.	Using yellow colour container with biohazard symbol is for anatomical and pathological waste	143	98.6	1	0.7
3.	Using red colour container with biohazard symbol is for infected plastics	143	98.6	2	1.4
4.	Using blue colour container with biohazard symbol is for infected glass items	141	97.2	4	2.8
5.	Using black colour container with biohazard symbol is for Cytotoxic waste, Expired medicines & Chemical waste	117	80.7	27	18.6
6.	Using green colour container with biohazard symbol is for kitchen waste	125	86.2	20	13.8
7.	Using white colour container with biohazard symbol is for non infected plastics and general waste	74	51	71	49
8.	Using protective devices like gloves, gown, mask, cap, boot while handling waste.	109	75.2	36	24.8
9.	Closing the container soon after putting the waste	123	84.8	22	15.2
10.	Disposal of sharps items Disinfect with chemicals Strong in puncture proof container/cutting by needle destroyer	127	87.6	18	12.4
11.	Monitoring the package the waste when it is filled ¾ of the cover in the colour coded bin	126	86.9	19	13.1
12.	Monitoring the internal transportation without spillage of waste materials	125	86.2	20	13.8
13.	Involves in giving education on biomedical waste management	124	85.5	21	14.5

DISCUSSION

The present study was a cross sectional study conducted to study knowledge, attitude and practices about Biomedical waste Management among nursing staff Anil Neerukonda Hospital, Visakhapatnam.

In this study, majority of the nurses belonged to the age group of 20-25 years (60%) followed by 26-30 years (30.3%), 31-35 years (8.3%) and 36-40 years (1.4%). In Amita et al,^[11] 53.3% study subjects were under 25-30 years of age, 23.3% study subjects were in 31-35 years of age, 13.3% of study subjects were under the age group of 36-40 years, 10.1% of study subjects were above 41 years. In Tiwari SK et al,^[12] mean age of participants was 21.54 + 2.49 years.

In this study, males were 13.1% and females were 86.9%. In Tiwari SK et al,^[12] males were 18.4% and females were 81.6%.

In this study, total years of experience was < 5 years in 76.6% nurses, 6-10 years in 22.1% nurses & 11-15 years in 1.4% nurses. In Amita et al,^[11] 16.1 % study subjects had 0-1 years of professional clinical experience, 30.2% of study subjects had 1-3 years of professional clinical experiences, 13.2 % of study subjects had clinical experience of 3-5 years, 40% of subjects had experience of more than 5 years.

In this study, professional qualification was B.SC Nursing in 55.2% nurses & general nursing and midwifery in 44.8% nurses. In Amita et al,^[11] 13.3% study subjects had professional qualification in A.N.M., 56.6% study subjects had professional qualification in G.N.M., 30.1% study subjects had professional qualification in B.Sc nursing. In Tiwari SK et al,^[12] professional qualification was B.SC Nursing in 59.5% nurses & general nursing and midwifery in 31.9% nurses.

In this study, 89.7% nurses attended orientation training program on BMW. In Amita et al,^[11] 46.7% study subjects didn't have any BMW education. In Lavanya KM et al,^[13] Out of 206 subjects, only 109(52.9%) had received training about BMW management. Majority of the nurses 67(64.4%) had undergone training.

Knowledge

In this study, most of the respondents had a great amount of knowledge regarding what is biomedical waste i.e. 98.6% gave correct responses and also 100% of the participants had a clear idea about the symbol of biomedical waste. 73.1% of the participants know why the segregation of waste is important whereas only 26.9% had a poor knowledge about this. 73.8% of the participants had knowledge about the ideal bin used to dispose the waste, rest were lacking in this aspect. 80.7%, 69.7% and 63.5% knew about the right colour coded bin used for anatomical or pathological waste, glass items and official type of waste respectively. 84.1% of the respondents were correct regarding the proper

disposal of sharp materials whereas only 15.9% of the respondents didn't know about this. Participants had average amount of knowledge in the following aspects: 64.1% were correct about the major classification of waste, 73.1% knew the importance of segregation of waste at the same time 26.9% were wrong about this, very few i.e. 53.1% had an idea regarding the responsibility to be taken if the waste gets mixed up with the yellow container, only 59.3% of the participants knew when the cover in the waste colour container has to be tied, accordingly 40.7% had no idea regarding this aspect, 72.4% were right about the time of storage of waste in the hospital. Participants had very little knowledge about how the cytotoxic was generated i.e. only 48.3% gave the correct response. Knowledge regarding color coding, disposal methods, universal precautions, and biomedical waste hazard symbols are crucial for the effective management of biomedical waste.

In Gonibeedu V et al,^[14] knowledge was good. In Mir MR et al,^[15] knowledge regarding biomedical waste rules, color coding of waste containers, segregation of waste at source, disinfection of hospital waste before disposal & transmission of diseases through biomedical waste was very good among the nursing staff of this hospital. The values being more than 70%. In Amita et al,^[11] maximum of the staff nurses 18 (60%) having very good knowledge regarding biomedical waste management, 9(30%) staff nurses having excellent knowledge, 3(10%) staff nurses having average knowledge regarding biomedical waste management. In Tiwari SK et al,^[12] majority of participants had poor level of knowledge in various domains of biomedical waste management like awareness (78.5%), color coding (84.7%), biomedical waste disposal methods (92.6%), and universal precautions (97.5%) except for biomedical hazard symbol (15.3%). In Lavanya KM et al,^[13] About sources of BMW, knowledge among the nurses was 81(77.9%). Knowledge about hazards to health was correct in 132 (64.1%) of the study group. It was 95(91.3%) among nurses. Hand washing as the best personal protective measure was known to 128 (62.1%) subjects with knowledge among nurses being 89(85.6%). Totally 126 (61.2%) study subjects knew about segregation at the point of generation, it was 57 (54.8%) among nurses. Totally 106(51.5%) knew about the color coded bins used for various categories of BMW. Knowledge among nurses was 61(58.7%). In Tamilselvi et al,^[16] 53% were aware of the segregation of cytotoxic drugs, 90% on segregation and disposal of sharps, 72% on infectious plastics. Only 67% were aware of the different colour bags used for segregation.

Proper segregation of biomedical wastes at the level of ward eliminates many of the infective diseases. This has been described previously during the Dravidian period, confirmed by the excavations near

Adichanallur. Hence, biomedical waste management practices are not new to the mankind.^[17] Some studies showed poor knowledge levels among nursing students when compared to medical students regarding biomedical waste management.^[18-20] Several other studies showed good/adequate knowledge levels among nurses.^[13,21-22] Another study showed adequate knowledge among nursing students regarding biomedical waste management.^[23] Nursing student needs to improve their knowledge and translate it into their clinical practice.

Attitude

In this study, 70.3% of the respondents strongly agreed to statement that if the health team members effectively implemented necessary measures in BMW, the incidence of illness will be reduced and the rest states of them just agreed. 62.8% of the participants strongly agreed that the nurses and other health members should be given training on BMW, whereas 32.4%, 2.8% and 2.1% have agreed, were undecided and disagreed respectively. 54.5% strongly agreed that there should be periodical classes and demonstration of biomedical waste management for upgrading the knowledge of the nursing staff. 46.9% strongly agreed for introducing BMW unit into the nursing curriculum so that it will bring out effective management in the working areas in future, whereas 40% agreed, 11% were undecided and 2.1% disagreed with the statement. 33.1% of the participants both strongly agreed and agreed to the statement that it is difficult to identify and categorise the waste, 13.1% were undecided, 17.9% and 1.4% have disagreed and strongly disagreed respectively for the above statement.

In Gonibeedu V et al,^[14] attitude was average. In Mir MR et al,^[15] attitude of the nurses towards segregation of infectious and non infectious wastes was positive with 80% in favor of implementation. In Amita et al,^[11] maximum of the staff nurses 15 (50.1%) having excellent practice level, 14 (36.6%) having very good knowledge, 1 (3.3%) having average knowledge. In Tiwari SK et al,^[12] Majority (93.3%, 91.4%, and 93.9%) of participants agreed that color-coding system is a simple method for segregating biomedical waste, wearing gloves is necessary to prevent medical waste hazards, and always putting waste in correct plastic bag respectively. About two-third (62% and 62.6%) participants agreed that biomedical waste can harm the health of the public at large, and all waste generated in hospital are infectious respectively. More than two in three participants disagreed that biomedical waste is an extra burden on their work (69.3%) and wearing PPE increases the risk of infection (68.7%). About 87.7% were willing to attend an educational program on biomedical management.

In Lavanya KM et al,^[13] the attitude of the study subjects toward BMW management as a part of their job was positive in 149(72.3%) i.e. in 86(82.7%) of

the nurses. All the waste generated in the hospital is infectious was said by 134(65%) subjects with 54(51.9%) among nurses. Only 143(69.4%) said hospital policy for BMW management is needed with 90 (86.5%) among nurses. Training about BMW management is necessary according to 148(71.8%) subjects with 80(76.9%) among nurses. Positive opinion about the necessity of periodical medical examination for staff was seen in 171(83%) staff with 99 (95.2%) among nurses. In Deepika K et al,^[24] attitude of the paramedical staff who opined that the BMW management adds extra burden to their work is quite alarming. This is worrisome and such attitude must be changed and the significance of proper disposal and management of BMW should be stressed. It must not be addressed as a extra burden of work. The study also revealed that few of the health care professionals are still not aware of the disposal of the needles in puncture proof container and such ignorance will predispose to needle stick injuries. A study by Pandit NB et. al,^[8] found that 98% of the nurses had a positive attitude Mohideen,^[25] conducted a study in Karnataka in South India to assess the KAP of nurses regarding on biomedical waste management. The study revealed very negligible percentage of the nurses had high knowledge (1.7%) and more than three-quarters of the nurses had below average knowledge. The study revealed the necessity for a training program on biomedical waste management. Nursing students had an excellent attitude regarding biomedical waste management which is comparable to studies among nursing students.^[26,27] Studies conducted among nurses and health care workers also showed positive attitude,^[28,29] while negative attitude was also shown among nurses.^[30] A study reported poor attitude among resident doctors regarding biomedical waste management in comparison to nursing staff.^[22]

Practices

In this study, majority of the participants i.e., 95.2% can identify and label infectious and non infectious waste. 98.6%, 98.6%, 97.2%, 80.7% , 86.2% and 51% of the study participants use yellow colour container with biohazard symbol for anatomical and pathological waste, red colour container with biohazard hazard symbol for infected plastics, blue colour container with biohazard symbol for infected glass items, black colour container with biohazard symbol for cytotoxic waste, expired medicines & chemical waste, green colour container with biohazard symbol for kitchen waste and white colour container with biohazard symbol for non infected plastics and general waste respectively. 86.9% of the participants agreed that monitoring the package of waste when it is filled 3/4th of the cover in the colour coded bin is done, whereas the rest 13.1% have no idea about this.

In Gonibeedu V et al,^[14] practice was average. In Mir MR et al,^[15] 70% practiced the disposal in specified color-coded bins, while as 72% made disposal of sharps in puncture proof containers but

only 30% were reporting the injuries due to improper disposal of sharps. In Tiwari SK et al.^[12] About 85.9% of participants segregate waste at their generation point. Majority of participants ensure tying up the waste bag when it is 3/4th filled (76.7%), a practice of not recapping the used needles (60.7%), dispose-off biomedical waste in the specified color-coded container (96.3%), discard used needles in needle destroyer (88.3%), record and report needlestick and sharps injury (84.0%) and change gloves between patients (81.6%). Only 66.9% and 81.6% of participants were vaccinated against Hepatitis B and TT respectively. Sadly, 60.7% had previous exposure to needle stick or sharps injury.

In Lavanya KM et al,^[13] Personal protective measures while handling waste was used by 148(71.8%) subjects with 90(86.5%) nurses. Hand-washing after handling waste was practiced by 142(68.9%) subjects which was seen in 93(89.4%) nurses. In Swain C et al,^[31] Staff nurses are doing only 82.5 % correct practice as per BMW New Rule. There is a scope of improvement to 100% in proper segregation practice. Because the segregation, which is the most important segment of Bio medical waste management is practically supervised by the staff nurses. Gupta et al,^[32] in a study on biomedical waste management revealed the infectious and non-infectious wastes are dumped together in the hospital premises and disposed with municipal waste. The results of the study concluded the need for strict enforcement of legal provisions and a better environmental management system for disposal of bio medical waste.

In a study by Patil GV, Pokhrel K,^[33] it was also found that the non-infectious waste was collected separately in different containers and treated as general waste. Singh K et. al,^[34] in Chandigarh revealed that the medical establishments in the rural area and smaller ones in the urban area dispose off their biomedical waste along with municipal solid waste and no waste management system exists. Rasheed S et. Al,^[35] in his study in Karachi revealed that 25% hospitals were segregating sharps, pathological waste, chemical, infectious, pharmaceutical, and pressurized containers at source. Personal protective measures while handling waste was used by 148(71.8%) subjects with significantly better use among nurses, (86.5%).^[36]

Since biomedical waste management is part of the nursing curriculum, the findings of the study are staggering for nurse educators. It is a need of the hour for nursing students to be abreast with recent amendments in rules and policies regarding biomedical waste management as they will be future health care providers. Clear written guidelines and policies concerning biomedical management with regular enhancements should be made for nursing students. Regular teaching and training about recent amendments as well as newer safe and cost-effective scientific methods of waste management and

periodic monitoring of practices regarding biomedical waste are highly recommended.

CONCLUSION

Overall, the knowledge, attitudes and practices towards biomedical waste management among the study respondents was satisfactory. Knowledge, attitudes and practices toward biomedical waste management were better among the nursing staff. Periodic assessment and regular teaching along with hands-on training programs with an emphasis on recent amendments in rules should be stressed to bridge the gap between knowledge, attitude, and practices.

Recommendations

- Training programs need to focus on empowering the nursing staff on biomedical waste management with broad scope and practical knowledge in all aspects. The ethical requirements and the institutional level policies form the directional pathway for the practical components in the organization.
- The right practices and other activities of BMW management and its ramifications in the form of avoiding of injuries, importance of vaccinations and following of universal precautions can be achieved when adequately supported by IEC (information, education and communication) strategies like handouts, stickers, charts, celebrations of various days like hand hygiene day and other days etc can help in bettering the practices of the employees of the organizations.
- Adequate supplies and equipment's should be available in all the departments to take care of waste properly.
- Training the staff with checklists and regular inspections can bring about accountability in the staff.

REFERENCES

1. Park K. Park's Textbook of preventive and social medicine. 27th edition. Banarsidas Bhanot Publishers. 2023.
2. Gordon JG, Rein Hardt PA, Denys GA. Medical waste management. In: CG (ed). Hospital epidemiology and infection control, (3rd). Lippincott Williams and Wilkins publication.2004: 1773-85.
3. Rao SK, Ranyal RK, Bhatia SS, Sharma VR. Biomedical waste management: An infrastructural survey of hospitals, MJAFI.2004;60(4):379-82.
4. Harrison B. States act to regulate medical waste. JADA.1991; 122: 118-20.
5. Ozbek M, Sanin FD. A study of the dental solid waste produced in the school of dentistry in Turkey. Journal of Waste Management. 2004; 25: 339-345.
6. Bhuyan AL. Conference reports. Journal of the Indian Society of Health Care and Waste Management. 2002; 1: 64.
7. Summers J. Asset disposal: Follow company policies or follow the law? Journal of Healthcare Material Management. 1991; 9: 54-56.
8. Pandit NB, Mehta HK, Kartha GP, Choudhary SK. Management of bio-medical waste; Awareness and practices in a district of Gujarat. Indian Journal of Public Health. 2005; 49: 245-247.

9. Rao PH. Report: Hospital waste management-awareness and practices: A study of three states in India. *Waste Management and Research*. 2008; 26: 297-303.
10. Kishore J, Goel P, Sagar B, Joshi TK. Awareness about biomedical waste management and infection control among dentists of a teaching hospital in New Delhi. *Indian Journal of Dental Research*. 2000; 11: 157-161.
11. Amita, Anjana, Dhiman A, Gautam A, Thakur A, Archana et al. A study to assess the knowledge and practices regarding biomedical waste management among staff nurses at Deen Dayal Upadhyaya Zonal Hospital, Shimla, Himachal Pradesh. *International Journal of Applied Research* 2017; 3(8): 704-708
12. Tiwari SK, Srivastava SP, Chauhan S. Knowledge, attitude and practices regarding biomedical waste management as per 2019 rules among nursing students. *Int J Health Sci Res*. 2021; 11(9): 41-48.
13. Lavanya KM, Majhi P. Knowledge, Attitude and Practices (KAP) about biomedical waste management among hospital staff- A cross sectional study in a tertiary care hospital, Andhra Pradesh, India. *J Community Health Manag* 2018;5(1):32-36
14. Gonibeedu V, Sundar M, Santhosh HC, Swamy DM. Outcome of Biomedical Waste Management Training Among Staff Nurses of Primary Health Centers of Hassan District. *Int Q Community Health Educ*. 2021 Apr;41(3):349-353
15. Mir MR, Ahamad J, Ahamad A, Jan R. Knowledge, attitude and Practices about Biomedical Waste management among Nursing Professionals of SKIMS Medical College Hospital Bemina-A Cross Sectional study. *IOSR-JNHS*. 2013;1(5):47-48
16. Tamilselvi, Devanithya. Assess the Knowledge, Attitude, and Practices about Biomedical Waste Management among Healthcare Personnel. *Saudi J Biomed Res*. 2020; 5(3): 39-40
17. The Hindu. Sunday March 14 2004. Archaeology India: Urn-burial site found at Adichanallur. Available from: <http://www.hindu.com/2004/03/14/stories/2004031400151100.htm>. [Last accessed on 2023 Jan 15].
18. Pinto V, Joshi S, Velankar D, Mankar M, Bakshi H, Nalgundwar A, et al. A comparative study of knowledge and attitudes regarding biomedical waste (BMW) management with a preliminary intervention in an academic hospital. *Int J Med Public Health*. 2014;4(1):91-5.
19. Rajdev S, Mullan S. Assessment of knowledge, attitudes & practices among doctors, Nurses & ward aids on nosocomial infections in tertiary care hospital. *Int J Med Microbiol Trop Dis* 2019;5(4):222-225.
20. Eshwar B. Knowledge, Attitude and Practice of Biomedical waste management among health care personnel in a tertiary care hospital in Puducherry. *Int J Biomed Res*. 2015 Mar 31;6:172.
21. Chudasama RK, Rangoonwala M, Sheth A, Misra SKC, Kadri AM, Patel UV. Biomedical Waste Management: A study of knowledge, attitude and practice among health care personnel at tertiary care hospital in Rajkot. *J Res Med Den Sci*. 2013;1:17-22.
22. Dey P, Das B. Knowledge, attitude, and practices about biomedical waste management as per 2016 rules among resident doctors and nursing staff in a tertiary care specialty hospital: A cross sectional study. *J Med Soc* 2020;34:31-5
23. Soyam GC, Hiwarkar PA, Kawalkar UG, Soyam VC, Gupta VK. KAP study of biomedical waste management among health care workers in Delhi. *Int J Community Med Public Health* 2017;4:3332-7.
24. Deepika K. Knowledge Attitude and Practice of Biomedical Waste Management among Health Care Workers in a Tertiary Care Hospital, Coimbatore, India. *Int J Curr Microbiol App Sci*.2019; 8(7): 1893-1897
25. Mohideen NM. A study to assess the knowledge, attitude and practices of nurses regarding 'bio medical waste management' in selected hospitals of Raichur. Bangalore, Karnataka. 2010. Available from: <http://119.82.96.198:8080/jspui/handle/123456789/2765>.
26. Jyoti S, Seema C, Diksha, Pooja K. Awareness of Biomedical Waste Management among Nursing Students: A Hospital Based Study in Haryana. *Indian J Prev. Soc. Med*. 2020; 51 (1): 10-17
27. Najotra DK, Slathia P, Raina S, Ghai S. Knowledge attitude and practices of biomedical waste management among medical and nursing students in a teaching hospital of J & K, India. *Indian J Microbiol Res* 2020;7(1):20-23
28. Mohamed HH, Abd El-Kader RG, Ibrahim AAW. Knowledge, Attitude and Practice of Health Care Personnel about Medical Waste Management in Selected Family Health Centers in Mansoura, Egypt. *Int J Innov Res Med Sci*. 2019 Jun 13;4(06):349 to 356.
29. Shyamala R, Naveen G. A Cross Sectional Study on Health Care Waste Management among Health Care Personnel in a Tertiary Care Center, Kannur, Kerala, India. *Int. J. Curr. Microbiol.App.Sci*.2016; 5(9): 340-345.
30. Sengodan VC, Amruth KH. Knowledge attitude and practice study on biomedical waste management among health care professionals and paramedical students in a Tertiary Care Government Hospital in South India. *Int J Env Health Eng* 2014;3:11.
31. Swain C. Knowledge attitude practice study on bio-medical waste management at district head quarters hospital, Dhenkanal, Odisha. *International Journal of Healthcare Sciences*. 2019;6(2): 299-311
32. Gupta S, Boojh R. Report: Biomedical waste management practices at Balrampur Hospital, Lucknow, India, *Waste Management and Research*, 2006. Available from: <http://wmr.sagepub.com>. [Last assessed on 2022 Sep 15]
33. Patil GV, Pokhrel K. Biomedical solid waste management in an Indian hospital: A case study. *Waste Manag*. 2005;25:592-9.
34. Singh K, Arora SK, Dhadwal PJ, Singla A, John S. Biomedical waste management in the U.T., Chandigarh. *J Environ Sci Eng*. 2004;46:55-60.
35. Rasheed S, Iqbal S, Baig LA, Mufti K. Hospital waste management in the teaching hospitals of Karachi. *J Pak Med Assoc*. 2005;55:192-5.
36. Shalini S, Harsh M, Mathur BP. Evaluation of Bio-medical Waste Management Practices in a Government Medical College and Hospital. *National Journal of Community Medicine*.2012;3(1).