MAR Pathology and Clinical Research (2025) 2:6

Research Article

Biomedical Waste Management: A Study of Assessment of Knowledge, Attitude and Practices among Healthcare Professionals in a Medium Size Laboratory in North Bengal

Dr. Ankush Chakraborty *

***Correspondence to:** Dr. Ankush Chakraborty, Consultant Pathologist & Lab Director, Suraksha Diagnostics Limited, Siliguri.

Received: 02 May 2025

Published: 08 May 2025

Introduction

Health care waste is a unique category of waste by the quality of its composition, source of generation, its hazardous nature and the need for appropriate protection during handling, treatment and disposal. Mismanagement of the waste affects not only the generators, operators but also the common people too.[1]

'Bio-medical waste' (BMW) means any solid and/or liquid waste including its container and any intermediate product, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research pertaining thereto or in the production or testing thereof.[2]

Due to the increase in the procedures that are carried out at the various health care setups, excessive amounts of waste have been generated at the centers of care. India approximately generates 2 kg/bed/day.[3] and this biomedical waste encompasses wastes like anatomical waste, cytotoxic wastes, sharps, which when inadequately segregated could cause different kinds of deadly infectious diseases like Human immunodeficiency virus(HIV) hepatitis C and B infections, etc[4] , and also cause disruptions in the environment, and adverse impact on ecological balance.[5, 6]

Adequate knowledge amongst the health care employees about the biomedical waste management rules and regulations, and their understanding of segregation, will help in the competent disposal of the waste in their respective organizations.[7]

Acceptable management of 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. Hence adequate knowledge, attitudes and practices of the staff of the health care institutes play a very important role.[8, 4, 9]

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 care giving to the community are trained.[10]

Studies documented from different parts of the country; still convey that there are gaps in the Knowledge, lacunae in the attitudinal component and inconsistency in the practice aspects which are matters of concern among the health care professionals.[8, 11-15]

Suraksha Diagnostics Limited is very well known medium size medical testing laboratory situated in Siliguri which is NABL accredited for more than a decade. It caters almost 400 samples every day, which can be categorized as medium size laboratory. So we are going for KAP analysis of all healthcare professionals present in lab.

Objectives of Study

1. To assess the levels of knowledge, attitudes and practices among laboratory technicians, technical trainee, medical transcriptionist, phlebotomists, housekeeping and miscellaneous staffs in medium size medical testing laboratory in Siliguri.
2. To assess the gaps in knowledge, attitudes and practices among these health care workers in the different departments of a medium size medical testing laboratory in Siliguri.

Materials & Methods

Study design: Cross-sectional study.

Study setting: medium size medical testing laboratory

Study population: Staff working in the different departments of the medical laboratory

Eligibility criteria: All consenting individuals amongst the different cadres of staff were included into the study.

Sample size: There were 21 eligible participants available for answering the preformed questionnaire on a certain day.

Sampling strategy: All staff working in the laboratory were included in the study, therefore no sampling was done. The study population was classified according to the different strata based on their designation as laboratory technologists, lab tech trainee, phlebotomists, transcriptionists, USG attendants, housekeeping staffs, floor attendant and inventory person present at the day of study. Allocation of the population according to the strata.

Ethical approval: The ethical clearance for the study was obtained from the Institutional Ethics Committee.

Method of data collection

The questionnaire was pretested and validated by a post-test and a pilot survey was conducted with a sample of 21 respondents, with representations from the various strata of the study respondents. The study tool consisted of 10 questions assessing the knowledge with specific responses, 10 questions assessing the attitude with agree/disagree/no comment as answers and 10 questions assessing the practices with yes/ no responses. The participants filled up the self-administered questionnaire without scope for undue help.

The questionnaire was printed on simple English so that everyone can understand and if needed verbal translation done for housekeeping staffs by an experienced professional who is involved in translating of

health survey questionnaires to accommodate the housekeeping staff. The questionnaire was also back translated to English for checking of possible discrepancies and incorporating if any changes were required. The identity of the study respondents were maintained anonymous at various stages of the study.

Data entry and analysis

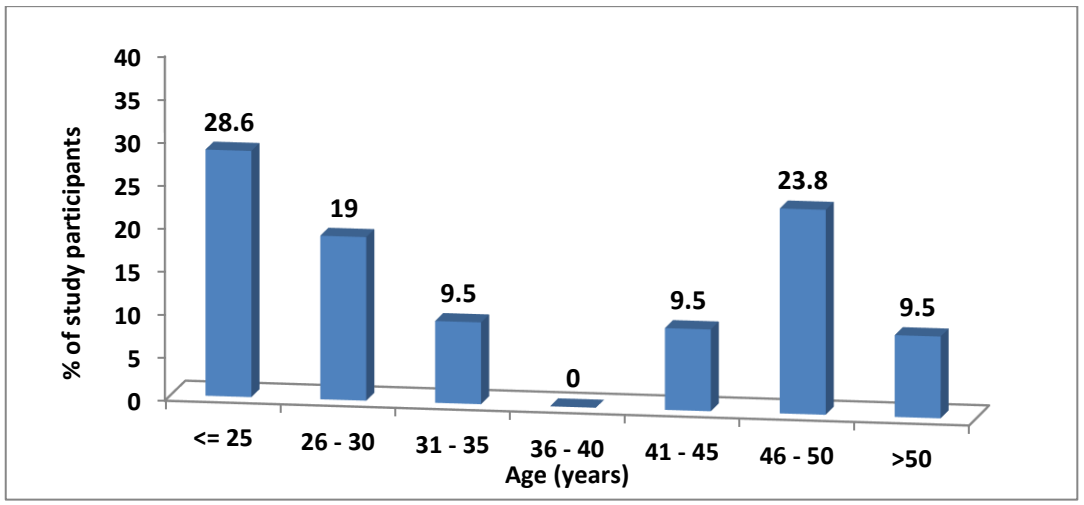
The collected data was organized and tabulated in Microsoft Excel 2016 (Microsoft Office 2016 package) and statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 16.0 (IBM Corp., Illinois, Chicago). The data was analyzed by appropriate statistical tools and represented by various tables, graphs, diagrams etc.

Continuous variables (age, work experience, domain-specific total scores) were expressed as mean ± standard deviation (SD). Categorical variables (gender, designation, domain-specific responses) were expressed as relative frequency and percentage.

Knowledge scores, Attitude scores and Practice scores of the study population did not have normal distribution, therefore Mann-Whitney U test (non-parametric test of significance) was employed to compare between domain scores. A "p-value" <0.05 was considered as statistically significant.

Inerpretations

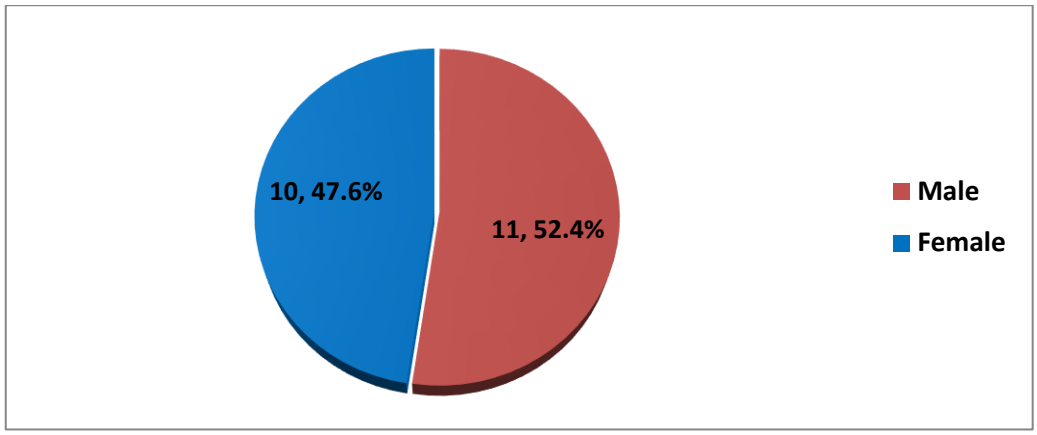
Figure 1: Bar diagram showing agewise distribution of study participants (N=21)



Final analysis was done on 21 study participants. Of whom, 28.6% were aged <=25 years (n=6), followed by those between 46-50 years of age (n=5). A 19% of the participants were in the age range of 26-30 years (n=4). There were 2 participants each in the age groups 31-35 years, 41-45 years and > 50 years (9.5% each)

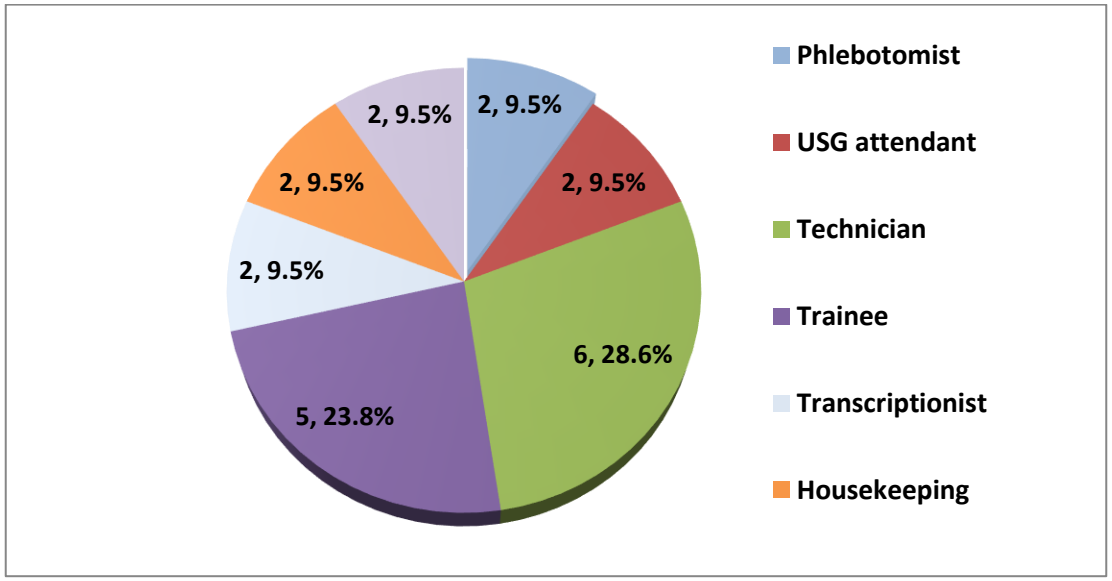
and none were between 36-40 years of age. The mean (±SD) age of the study participants was 35.1 (±13.5) years; where the minimum age was 18 years and the maximum age was 58 years.

Figure 2: Pie diagram showing distribution of study participants according to gender (N=21)



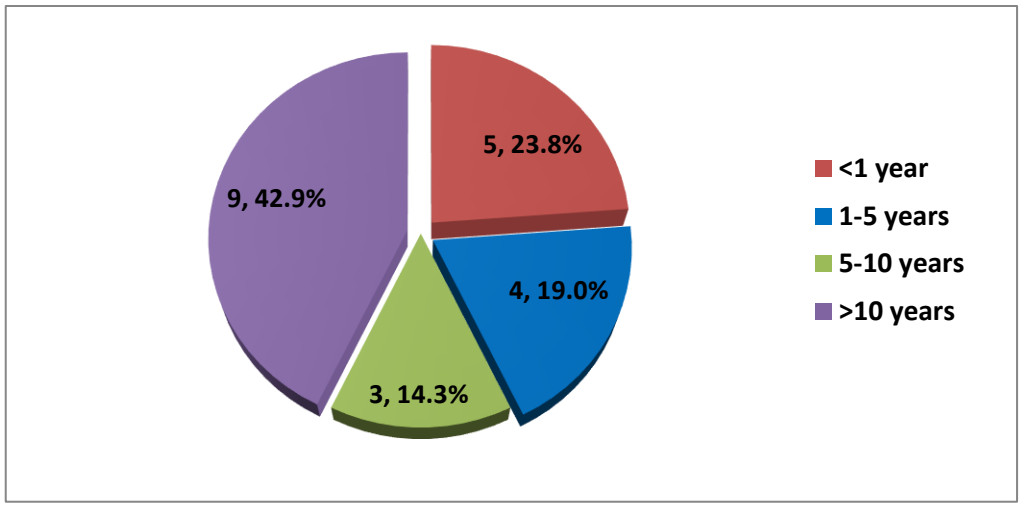
There was an approximately equal gender distribution among the study participants with 11 males (52.4%) and 10 females (47.6%).

Figure 3: Pie diagram showing distribution of study participants according to designation (N=21)



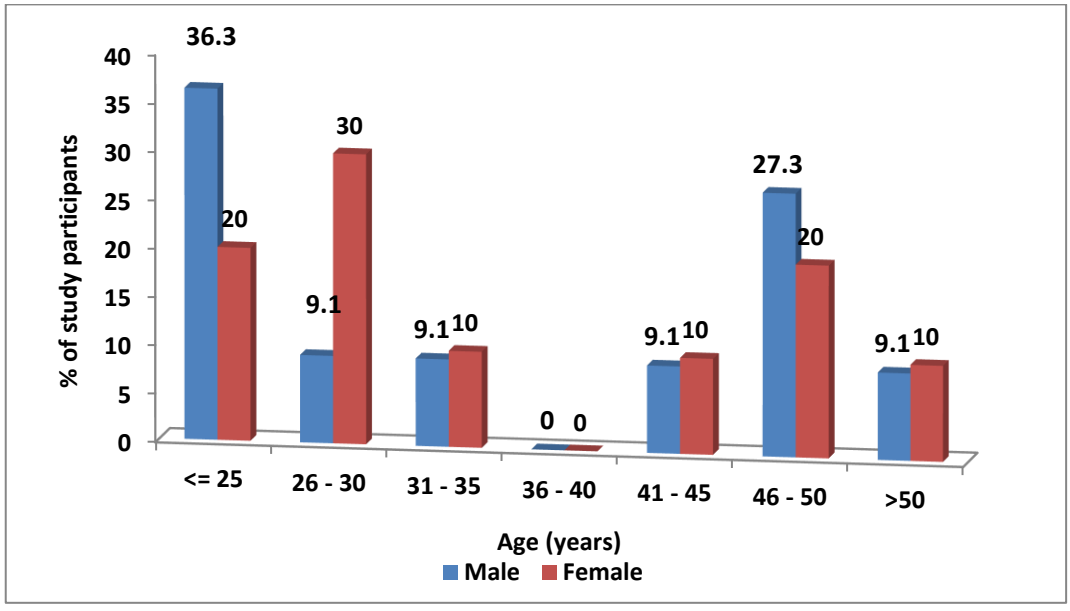
The majority of study participants were technicians (28.6%), followed by trainees (23.8%). Other designations, including phlebotomists, USG attendants, transcriptionists, housekeeping staff, and others, each accounted for 9.5% of the total.

Figure 4: Pie diagram showing distribution of study participants according to duration of work experience (N=21)



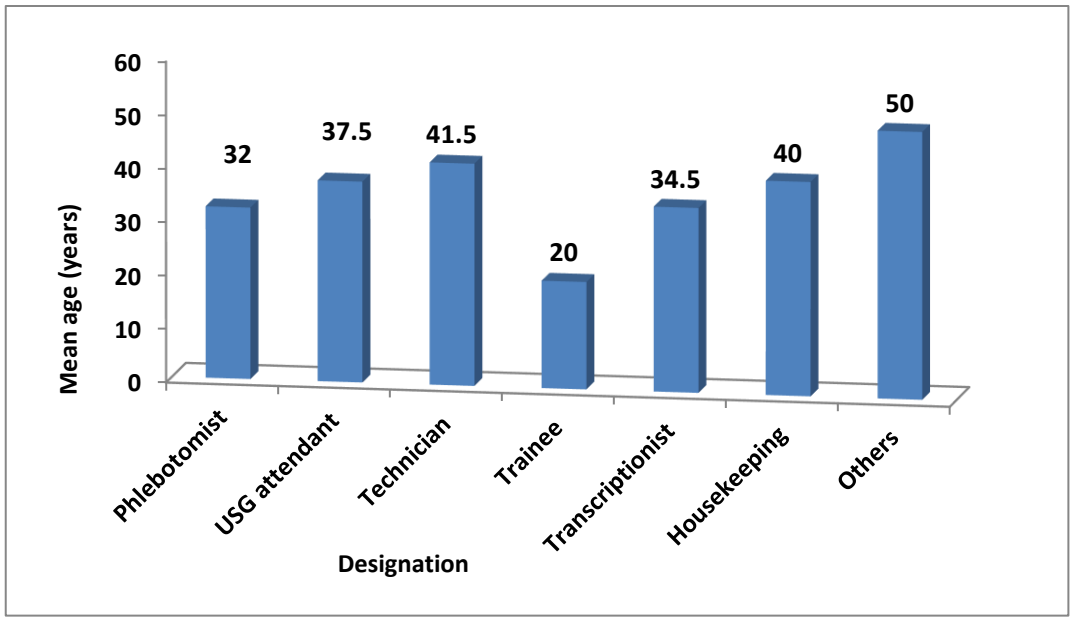
Most participants had over 10 years of work experience (42.9%), followed by those with less than 1 year of experience (23.8%). The remaining participants had 1-5 years (19%) and 5-10 years (14.3%) of experience.

Figure 5: Bar diagram showing distribution of study participants according to age and gender (N=21)



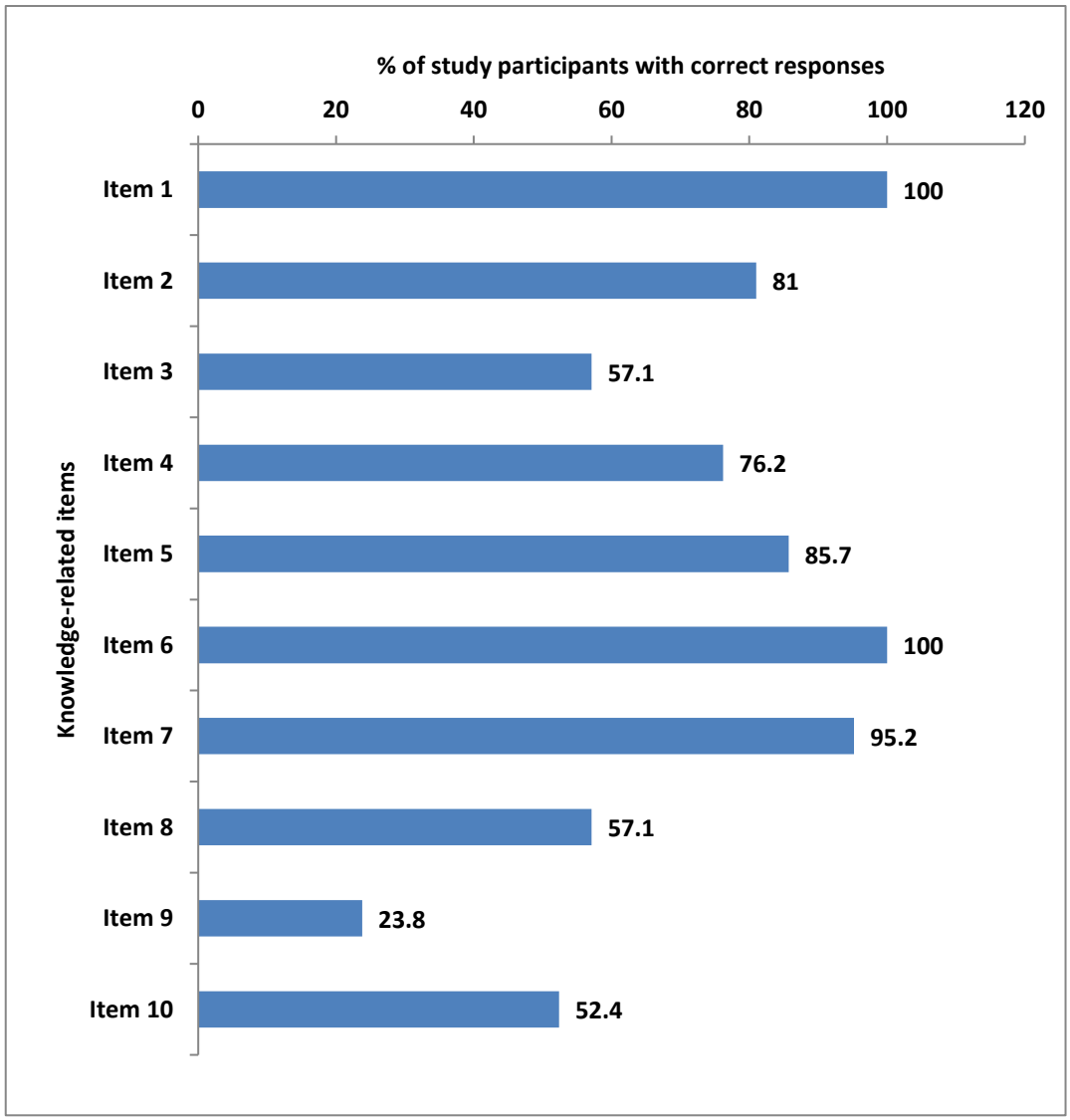
Among males, the highest proportion (36.3%) were aged ≤25 years, while in females, the highest proportion (30.0%) were aged 26-30 years. Both genders had similar distributions in older age groups, with 9.1% of males and 10.0% of females aged >50 years.

Figure 6: Bar diagram showing distribution of study participants according to designation and age (N=21)



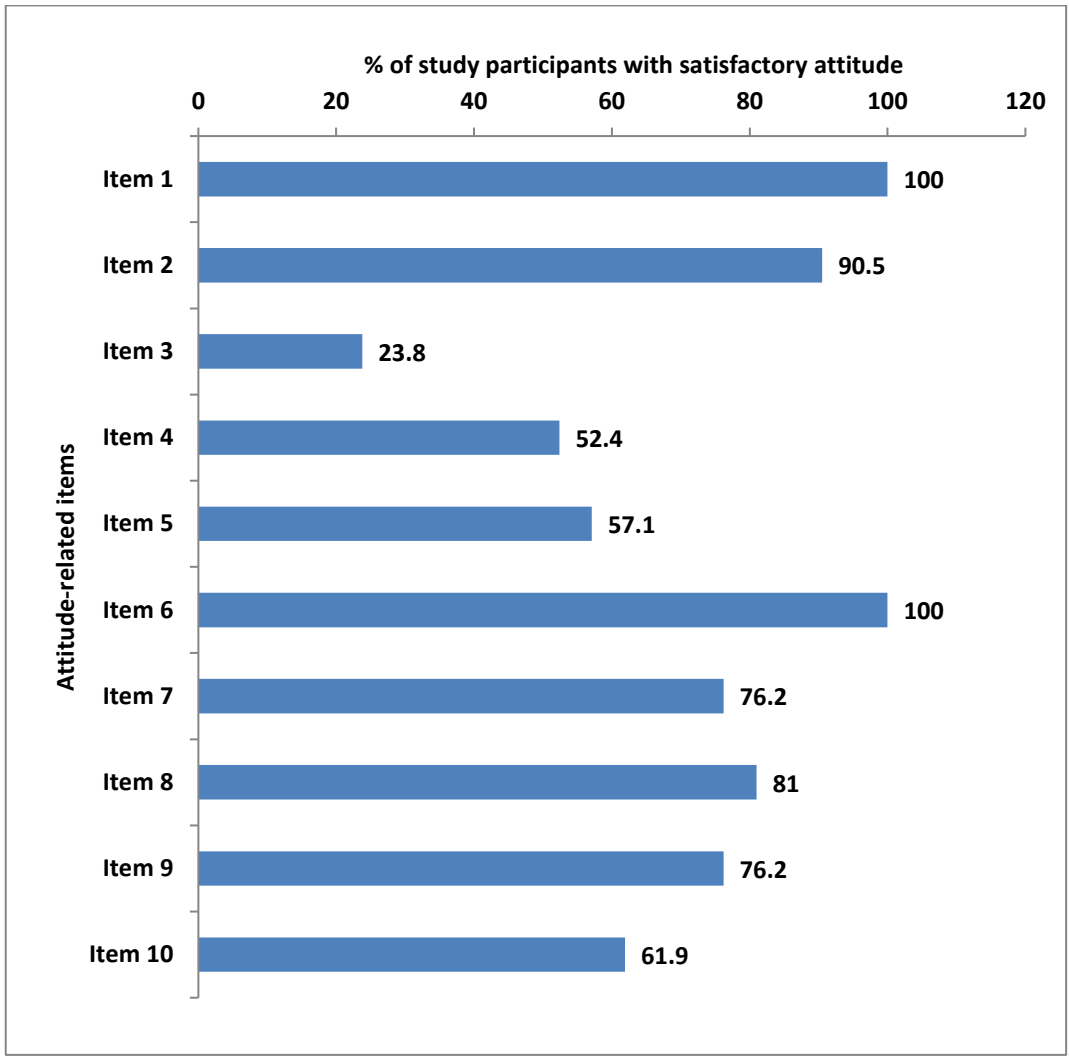
The youngest group was trainees with a mean (±SD) age of 20 (±3.5) years, while the oldest were floor assistant and inventory manager with a mean (±SD) age of 50 (±11.3) years. Housekeeping staff showed the highest variability in age with a standard deviation of 22.6 years.

Figure 7: Bar diagram showing distribution of study participants according to performance in knowledge-related items (N=21)



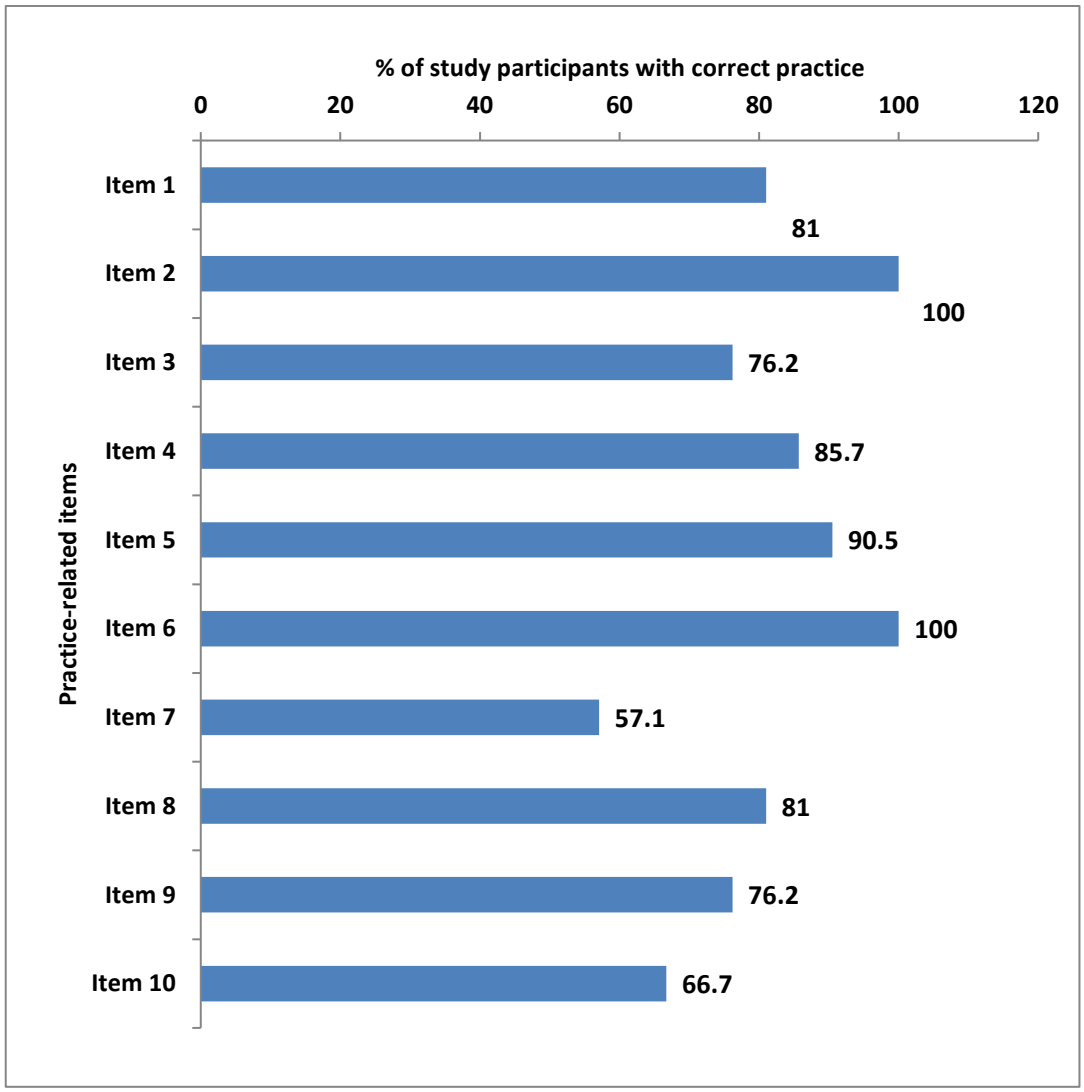
Most participants demonstrated good knowledge related to biomedical waste segregation, with 100% correctly answering questions pertaining to microbiological waste and waste-generating areas. High accuracy was also observed for proper disposal of plastic infectious items (85.7%) and syringe coverings (81.0%). However, knowledge gaps were evident in disposing of sharp items (57.1%), blood product packs (23.8%), and glass bottles (52.4%), indicating the need for targeted training in these areas.

Figure 8: Bar diagram showing distribution of study participants according to performance in attitude-related items (N=21)



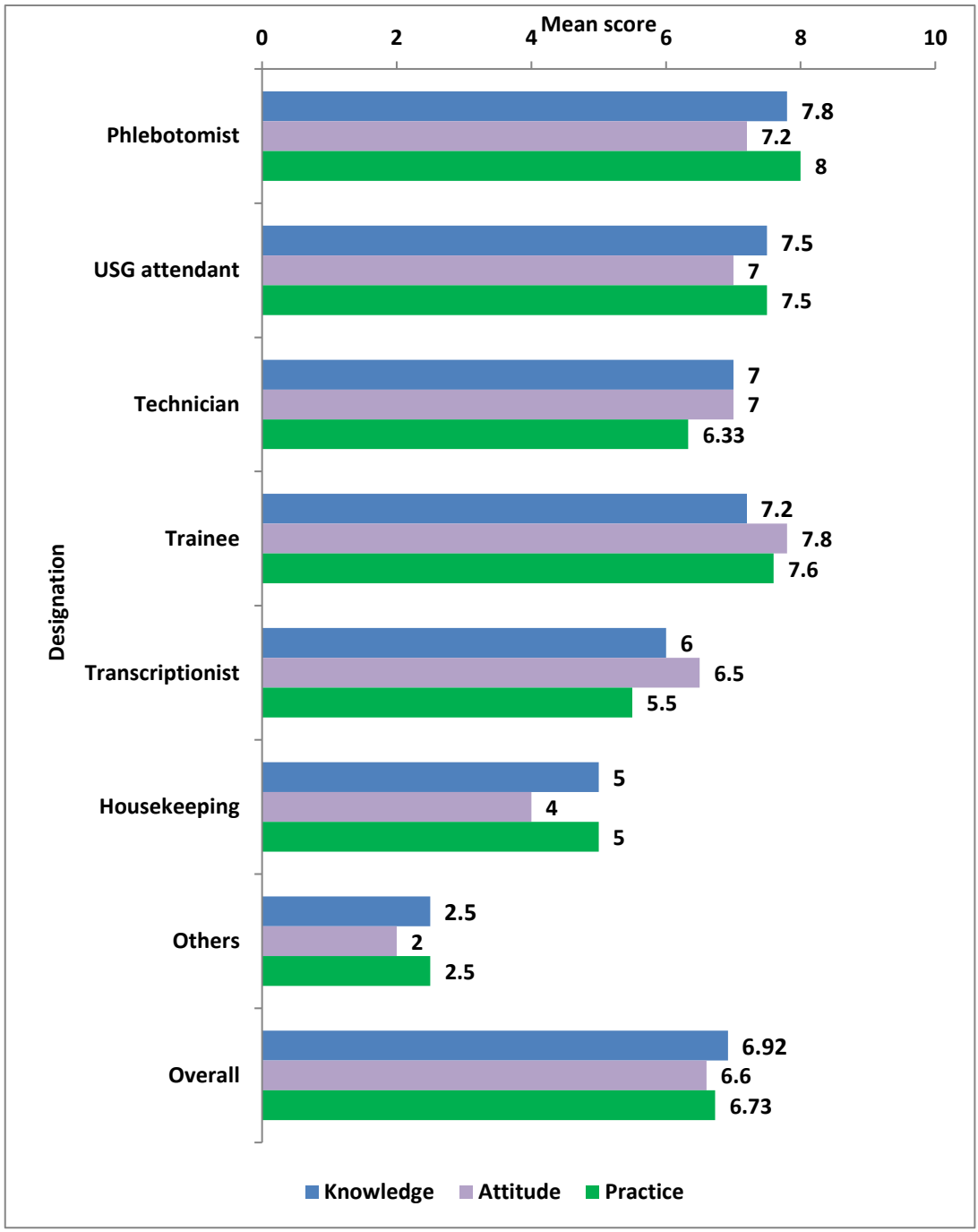
Participants exhibited a highly positive attitude toward the necessity of safe disposal of biomedical waste and the use of PPE (100%). Most also recognized teamwork (90.5%) and the importance of colour coding (81.0%). However, areas needing improvement include attitudes toward upgrading knowledge (61.9%) and recognizing BMW management as a risk for disease transmission (52.4%).

Figure 9: Bar diagram showing distribution of study participants according to performance in practice-related items (N=21)



Participants demonstrated excellent practices in PPE usage (100%) and labeling waste bins (100%). High adherence was noted for segregating waste (81.0%) and disposing of sharps correctly (85.7%). However, routine inspection of waste bins (57.1%) and participation in training sessions (66.7%) were areas of concern.

Figure 10: Composite bar diagram showing total knowledge, attitude and practice scores according to designation and overall (N=21)



The study participants showed moderate overall performance in knowledge (6.92 ± 2.14), attitude (6.60 ± 1.70), and practice (6.73 ± 1.78), which were not significantly different from each other. Among the designations, phlebotomists had the highest practice score (8.00 ± 0.71), while trainees scored the highest in

attitude (7.80 ± 0.84). Technicians performed moderately across all domains, while transcriptionists had lower scores, particularly in practice (5.50 ± 0.71). Housekeeping and other staff (floor assistant, inventory) scored the lowest in all domains, especially in attitude (4.00 ± 1.41 and 2.00 ± 0.00, respectively).

Conclusion and Recommendations

In India, dealing with biomedical waste has become a difficult task. Biomedical waste management has been identified as a source of concern by both government and non-government organizations. Any healthcare facility that produces biomedical waste must set up the necessary treatment facilities to ensure proper waste treatment and disposal, reducing the risk of biomedical hazards being exposed to workers, patients, physicians, and the general public. Safe and efficient biomedical waste management is not only a legal requirement but also a social obligation.

Healthcare workers must have adequate knowledge regarding the proper handling of biomedical waste management, prevention of infection, and prevention of transmission of diseases. A high level of practice regarding the proper handling of Personal Protective Equipment is recommended in the present study. The present findings raise the necessity to organize continuous training programs in the form of symposia, seminars; and regular periodic workshops on biomedical waste management to develop awareness among healthcare workers in all the Healthcare setups. Standard guidelines on biomedical waste management should be updated time to time considering the nature of disease spread and contamination.

Limitations

There was a chance for recall bias in this study as it needed to recall for knowledge-related questions. However, randomization was done to select laboratory as well as participants to reduce the bias. The practice was observed directly by the researcher which might have been biased. This study could be repeated as an interventional investigation with larger samples, including all kinds of healthcare workers from a larger area.

Acknowledgement: None

Conflict of interest: There is not any conflict of interest.

References

1. Tenglikar PV, Kumar AG Kapate.R et al. Knowledge, Attitude, and Practices of HealthCare Waste Management amongst Staff of Nursing Homes of Gulbarga City. Journal of Pharmaceutical and Biomedical Sciences, 19(19)1-3 (2012).

2. Sharma A K. Biomedical Waste (Management and Handling) Rules. First edition. Bhopal. Suvidha Law House. 12

3. Patil AD, Shekdar AV. Health-care waste management in India. J Environ Manage.; 63:211-20 (2001).

4. Prem Nath A, Prashanthini V, Visvanathan C. Healthcare waste management in Asia. Waste Management; 30: 154-61 (2010).

5. Lakshmikantha H. Report on waste dump sites near Bangalore. Waste management; 26(6): 640-50 (2006).

6. Misra V, Pandey SD. Hazardous waste, impact on health and environment for development of better waste management strategies in future in India. Environment International; 31: 417-31(2005).

7. Kini B S, Kumar , Kumar S, Reddy M, Nabar A S, Kamath V G, Kamath A, Eshwari K, Knowledge, Attitudes and Practices regarding Biomedical Waste Management among staff of a tertiary healthcare centre in coastal Karnataka, J Pub Health Med Res; 2(1):20-4 (2014).

8. Pattnaik S, Reddy MV. Assessment of Municipal Solid Waste management in Puducherry(Pondicherry), India. Resources, Conservation and Recycling.; 54:512-20 (2010).

9. Mathur V, Dwivedi S, Hassan MA, Misra RP. Knowledge, Attitude, and Practices about Biomedical Waste Management among Healthcare Personnel: A Cross-sectional Study.Indian J Community Med; 36: 143-5 (2011).

10. Radha R. Assessment of existing knowledge, attitude, and practices regarding biomedical waste management among the health care workers in a tertiary care rural hospital. Int J Health Sci Res; 2(7):14-19 (2012).

11. Verma LK, Mani S, Sinha N, Rana S. Biomedical waste management in nursing homes and smaller hospitals around Delhi. Waste Management; 28:2723-34 (2008).

12. Kumar S, Bhattacharyya JK, Vaidya AN, Chakrabarti T, Devotta S, Akolkar AB.Assessment of the status of solid waste management in metro cities, state capitals, class I cities, and class II towns in India: An insight. Waste Management; 29: 883-95 (2009).

13. Pandit NB, Mehta HK, Kartha GP, Choudhary Sk. Management of biomedical waste: Awareness and practices in a district of Gujarat. Indian J Public Health; 49: 245-7 (2005).

14. Rao PH. Report: Hospital waste management – awareness and practices: A study of three states in India. Waste Manage Res.; 26:297-303 (2008).

15. 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, India. Indian J Dent Res;11:157-61 (2000).