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A study to evaluate the effectiveness of an educational package on biomedical waste management in terms of knowledge and practice among nursing staff in a selected hospital of New Delhi

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Abstract
Biomedical waste is defined as any waste that is generated during the diagnosis, treatment, or immunization of human beings or animals, or in research activities and the production or testing of biologicals. Improper management of biomedical waste presents a serious threat to both public health and the environment. As key healthcare providers, nursing staff are closely involved in the generation of such waste and play a vital role in its initial handling and disposal. This study was conducted to assess the knowledge and practices regarding biomedical waste management among nursing staff in a pediatric care unit in a selected hospital of New Delhi. The objectives of the study were 1. To assess knowledge of staff nurses regarding biomedical waste management 2. To observe the practice of staff nurses regarding biomedical waste management. 3.To evaluate effectiveness of educational package regarding biomedical waste management**.** A quantitative pre-experimental approach was adopted with one group pre-test post-test design. 60 samples were selected by using non-probability convenient sampling technique. The data was analyzed and interpreted by using descriptive and inferential statistics. The effectiveness of educational package on biomedical waste management was assessed by using paired 't' test score. The findings indicated that although most participants possessed a general understanding of biomedical waste segregation, significant gaps persisted in key areas, including color coding, waste handling procedures, and the use of protective equipment. Also inconsistencies were evident between what participants knew and what they practiced. The educational package on biomedical waste management was significantly effective in terms of gain in knowledge and improvement in practices. To ensure safe and effective biomedical waste management, the study recommends ongoing training programs and stricter enforcement of existing protocols.

Keywords: Biomedical waste management**,** educational package

1. Introduction

Biomedical Waste Management is an essential and integral part of healthcare services, aimed at ensuring the safe handling and disposal of waste generated during medical and allied procedures. This type of waste is potentially hazardous as it may contain infectious agents, sharps, toxic chemicals, and radioactive materials. If not managed properly, biomedical waste can lead to serious health hazards including the spread of infections like HIV, hepatitis B and C, as well as environmental pollution through the contamination of water, soil, and air.

In pediatric care units, where patients are especially vulnerable due to immature immune systems, the importance of meticulous biomedical waste management cannot be overstated. Healthcare workers, particularly staff nurses, play a crucial role in ensuring waste is handled safely from the point of generation to final disposal. Recognizing the potential dangers posed by biomedical waste, the Government of India, under the Ministry of Environment, Forest and Climate Change, introduced the Biomedical Waste Management Rules in 2016, with amendments in subsequent years. These rules provide a comprehensive framework for the categorization, segregation, storage, treatment, and disposal of biomedical waste. They emphasize color-coded waste segregation, use of barcoding for traceability, timely collection, proper labeling, use of personal protective equipment, and the establishment of centralized treatment facilities such as Common Biomedical Waste Treatment Facilities.

A quasi-experimental study was designed to assess the effectiveness of an educational package on the knowledge and practices related to biomedical waste management among nursing staff in a selected hospital. The educational package provides a detailed overview of definition and

sources of healthcare waste, principles of biomedical waste management, categories of biomedical waste, disposal methods with advantages & disadvantages, steps involved and roles and responsibilities of nurses in biomedical waste management.

By evaluating pre- and post-intervention knowledge and practices scores, the study aims to provide evidence for the implementation of ongoing training programs and policy reinforcement to ensure safer healthcare environments.

Regular training and sensitization programs for staff nurses and other healthcare workers are critical to fostering a culture of safety, accountability, and environmental responsibility in all healthcare settings.

2. Materials and Methods

A quantitative pre-experimental approach was adopted to assess the knowledge and practice of staff nurses regarding biomedical waste management. 60 nursing personnel were in Pediatric Cardiac Intensive Care Unit and pediatrics ward were selected by using non-probability convenient sampling technique in selected hospital of New Delhi, India. The tool developed by the researcher comprised of three sections. Section A consists of findings related to sample characteristics and demographic variables including age n years, professional qualification, years of experience in pediatrics unit, previous training on biomedical waste management, Section B consists of structured knowledge questionnaire containing 20 questions and Section C consists of 10 point practice checklist.

Data collection Procedure

Data was collected after obtaining the formal permission from the concerned authorities. The study was conducted in selected hospital of New Delhi from 16th June 2025 to 30th June 2025. The investigator selected 60 nursing staff posted in Pediatric Cardiac Intensive Care Unit and pediatrics ward by using non-probability convenient sampling technique. The data obtained from 60 samples were analyzed by using both descriptive and inferential statistics.

3. Results and Discussion

Section-I: Findings related to description of sample characteristics

In the present study the majority (70%) of the nursing personnel were in the age group of 22 - 26 years, (16%) in age group of 26 - 30 years, and remaining (14%) in age group of more than 30 years. 56% of nursing personnel were qualified as B.Sc. Nursing, 37% had GNM Nursing. Majority (64%) of the nursing personnel were having experience less than 2 years, (20%) were having experience 2-5 years and (16%) of the nursing personnel were having more than 5 years of experience and (100%) sample reported having previous training on biomedical waste management**.**

Section-II: Findings related to knowledge scores of sample population

Table 1: Computing‘t’ value to find out significant difference between mean pre-test and post-test knowledge scores of nursing personnel

N=60

Knowledge Scores	Mean	Mean Difference	S.E.	‘t’ value
Pre-Test	8.5	9.5	4.75	2.00
Post-Test	18			

‘t’ value df (59) level = 2.00, P>0.05= significant at 0.05 level

The mean post-test knowledge score (18) was higher than mean pre-test score (8.5) of the study group. The mean difference (9.5) between pre-test and post-test knowledge scores was found to be statistically significant as evident from t-value (2.00) at 0.05 significance level. Therefore the mean difference was a true difference and not by chance.

Section-III: Findings related to practice scores of sample population

Table 2: Computing ‘t’ value to find out significant difference between mean pre-test and post-test practice scores of nursing personnel

N=60

Practice Scores	Mean	Mean Difference	S.E.	‘t’ value
PRE-TEST	4.5	4	1.88	2.13
POST-TEST	8.5			

‘t’ value df (59) level =2.00, P>0.05= significant at 0.05 level

The mean post-test practice score (8.5) was higher than mean pre-test score (4.5) of the study group. The mean difference (4) between pre-test and post-test practice scores was found to be statistically significant as evident from t-value (2.13) at 0.05 significance level. Therefore, the mean difference was a true difference and not by chance.

4. Conclusion

The following conclusion could be drawn from the findings of the study:

In the present study the majority (70%) of the nursing personnel were in the age group of 22 - 26 years, majority (56%) of nursing personnel were qualified as B.Sc. Nursing, majority (64%) of the nursing personnel were having experience less than 2 years and all (100%) sample reported having previous training on biomedical waste management**.**

The mean post-test knowledge score (18) was higher than mean pre-test score (8.5) of the study group. The mean post-test practice score (8.5) was higher than mean pre-test score (4.5) of the study group. The educational package on biomedical waste management serves as a vital tool to enhance the knowledge and improve practices related to biomedical waste management.

By focusing on essential aspects such as definition and sources of healthcare waste, principles of biomedical waste management, categories of biomedical waste, disposal

methods with advantages & disadvantages, steps involved and roles and responsibilities of nurses in biomedical waste management. and adherence to safety protocols, this program empowers nurses to deliver safer and more effective waste segregation and disposal. Ensuring continuous training, competency assessment, and adherence to institutional guidelines is crucial in maintaining high standards in the management of biomedical waste.

The study concludes that the educational package was effective to enhance knowledge and improve practical implementation on biomedical waste management strategies. To enhance safe waste handling and minimize health risks, it is essential to strengthen training initiatives, conduct regular audits, and reinforce institutional policies. Continuous education, monitoring, and commitment at all levels of healthcare are essential to maintain high standards of waste management

Conflict of Interest
Not available.

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