



A PRE-EXPERIMENTAL STUDY TO ASSESS THE EFFECTIVENESS OF STRUCTURED TEACHING PROGRAMME ON KNOWLEDGE REGARDING BIOMEDICAL WASTE MANAGEMENT AMONG B.Sc. NURSING FIRST SEMESTER STUDENTS IN SELECTED NURSING INSTITUTES OF DISTRICT PATIALA, PUNJAB.

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Abstract- Background: Biomedical waste management (BMW) is an essential component of infection prevention and environmental safety in healthcare settings. Inadequate knowledge regarding biomedical waste handling among nursing students may increase the risk of healthcare-associated infections, occupational hazards, and environmental contamination. Structured educational interventions can improve students' understanding and promote safe waste management practices.

Aim: To assess the effectiveness of a structured teaching programme on knowledge regarding biomedical waste management among B.Sc. Nursing first semester students in selected nursing institutes of District Patiala, Punjab.

Methodology: A quantitative research approach with a pre-experimental one-group pre-test and post-test design was adopted. Sixty B.Sc. Nursing first semester students were selected using purposive sampling. Data were collected using a self-structured knowledge questionnaire. A structured teaching programme on biomedical waste management was administered after the pre-test, followed by a post-test. Descriptive and inferential statistics were used to analyse the data.

Results: The mean pre-test knowledge score was 27.65, while the mean post-test knowledge score increased to 35.75. The calculated paired t value (8.013) was greater than the tabulated t value (1.671) at the 0.05 level of significance, indicating a statistically significant improvement in knowledge after the structured teaching programme.

Conclusion: The structured teaching programme significantly improved the knowledge of B.Sc. Nursing first semester students regarding biomedical waste management. Educational interventions should be incorporated regularly into nursing education to enhance safe biomedical waste handling practices.

Keywords: Biomedical waste management, structured teaching programme, nursing students, knowledge, pre-experimental study.

I. INTRODUCTION

Biomedical waste management is a critical aspect of healthcare that ensures the safe handling, segregation, transportation, treatment, and disposal of waste generated during patient care and healthcare activities. Improper management of biomedical waste exposes healthcare workers, patients, waste handlers, and the community to infectious diseases and environmental hazards.

Nursing students are among the future healthcare professionals who frequently participate in clinical activities and are therefore at increased risk of exposure to biomedical waste. Adequate knowledge regarding biomedical waste management is essential to reduce occupational hazards, prevent the spread of infection, and comply with national biomedical waste management guidelines.

Structured teaching programmes are recognized as effective educational strategies for improving knowledge and promoting evidence-based practices among nursing students. Assessing the effectiveness of such educational interventions provides valuable evidence for strengthening nursing education and improving patient and environmental safety.

II. OBJECTIVES OF THE STUDY

1. To assess the pre-test knowledge regarding biomedical waste management among B.Sc. Nursing first semester students.
2. To administer a structured teaching programme on biomedical waste management.
3. To assess the effectiveness of the structured teaching programme by comparing pre-test and post-test knowledge scores.
4. To determine the association between knowledge scores and selected socio-demographic variables.

III. MATERIALS AND METHODS

Research Approach and Design

A quantitative research approach was adopted. A pre-experimental one-group pre-test and post-test design was used for the study.

Research Setting

The pilot study was conducted at Adarsh College of Nursing, Patiala, Punjab, and the main study was conducted at Ashoka Institute of Nursing, Patiala, Punjab.

Population and Sample

The target population consisted of B.Sc. Nursing first semester students in District Patiala, Punjab. The sample comprised 60 B.Sc. Nursing first semester students.

Sampling Technique

Non-probability purposive sampling technique was used to select 60 B.Sc. Nursing first semester students.

Inclusion and Exclusion Criteria

Students who were willing to participate and available during the period of data collection were included. Students who were unwilling to participate or unavailable during data collection were excluded.

Research Tool

A self-structured knowledge questionnaire regarding biomedical waste management was used. The questionnaire consisted of two sections:

Section A: Socio-demographic variables including age, gender, previous knowledge, previous training/seminar and source of information.

Section B: Self-structured knowledge questionnaire regarding biomedical waste management.

The questionnaire contained 45 items. Each correct answer received one mark and an incorrect answer received zero. The maximum possible score was 45.

Knowledge scores were classified as:

Knowledge level	Score
Inadequate	0-15
Moderate	16-30
Adequate	31-45

Validity and Reliability

Content validity of the tool was established through five experts in Medical Surgical Nursing, and amendments were made according to their suggestions. The reliability coefficient of the knowledge questionnaire was $r=0.72$, indicating that the tool was reliable.

Structured Teaching Programme

The structured teaching programme was developed based on the identified knowledge areas and relevant literature. The programme covered definition and types of biomedical waste, classification, colour coding, health hazards associated with improper management, management of biomedical waste and the role of nurses.

The teaching programme was delivered using a lecture-cum-discussion method. The duration was 35 minutes.

Data Collection Procedure

Data collection was conducted in April 2025. Sixty B.Sc. Nursing first semester students were selected using purposive sampling. After obtaining consent and explaining the purpose of the study, the pre-test was conducted using the self-structured knowledge questionnaire. The structured teaching programme was subsequently administered. A post-test was conducted one week later.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethical Committee of Adarsh College of Nursing, Patiala. Necessary institutional permissions were obtained, written informed consent was taken from participants, and anonymity and confidentiality were maintained.

Data Analysis

Descriptive statistics including frequency, percentage, mean and standard deviation were used. A paired t-test was used to assess the effectiveness of the structured teaching programme, and the Chi-square test was used to determine associations with selected socio-demographic variables.

IV. RESULTS

Section-I

Table No 1: Frequency and Percentage distribution of socio -demographic variables of B.Sc. nursing 1st semester students.

Table 1: presents the socio-demographic characteristics of the study participants. The findings describe the distribution of B.Sc. Nursing first semester students according to age, gender, previous knowledge regarding biomedical waste management, attendance at any training or seminar, and source of information. The data indicate the baseline characteristics of the participants included in the study.

N:60

S. No.	Socio- demographic Variables of B.Sc. nursing1stsemester students	Category	Frequency	Percentage (%)
1	Age in years	18-19	38	63.3%
		20-21	18	30.0%
		Above21	4	6.7%
2	Gender	Male	3	5.0%
		Female	57	95.0%
3	Do you have knowledge regarding Biomedical waste management?	Yes	43	71.7%
		No	17	28.3%
4	Do you attend any training or seminar on Biomedical waste management?	Yes	7	11.7%
		No	53	88.3%
5	Source of information	Journals	8	13.3%
		E-books	23	38.3%
		Clinical	19	31.7%
		Social media	10	16.7%

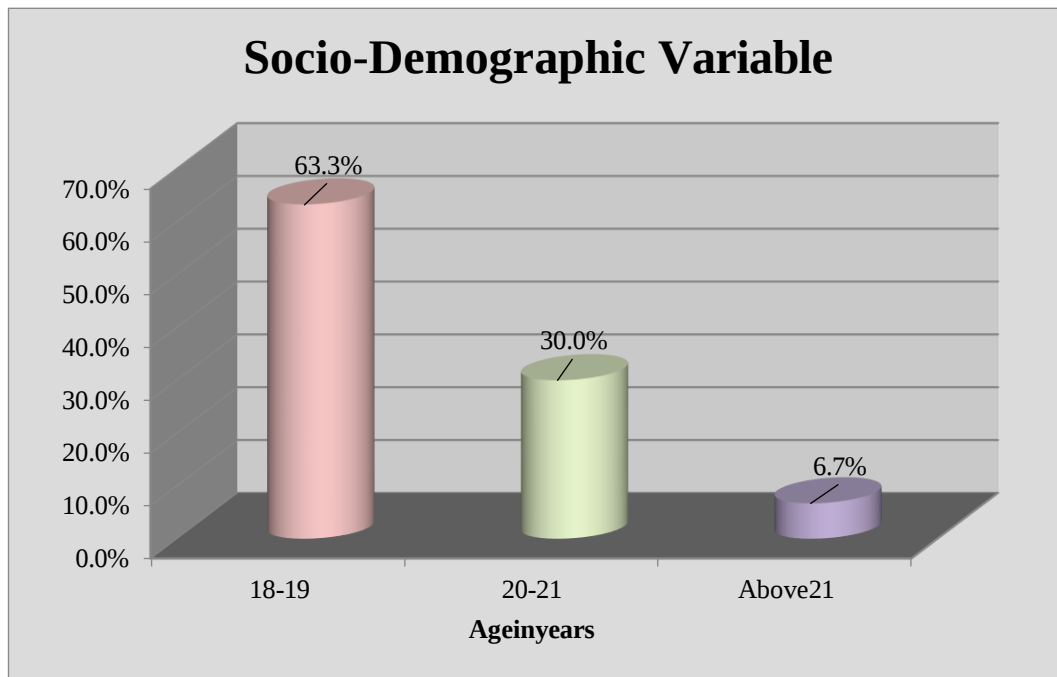


Figure No.1 : Bar graph showing percentage distribution of age of B.Sc. nursing 1st semester students.

Section-II

Table No 2: Distribution of pre-test knowledge score regarding biomedical waste management.

Table no. 2 shows percentage distribution of pre-test knowledge score of B.Sc. nursing 1st semester students regarding biomedical waste management shows that majority 44(73.3%) of B.Sc. nursing first semester students had moderate knowledge score followed by 14(23.3%) having adequate knowledge score and 2 (3.30%) have inadequate pre-test score regarding the biomedical waste management.

N=60

PERCENTAGE DISTRIBUTION OF PRE-TEST KNOWLEDGE SCORE		
Category score	Frequency	Percentage (%)
Inadequate(0-15)	2	3.30%
Moderate(16-30)	44	73.3%
Adequate(31-45)	14	23.30%

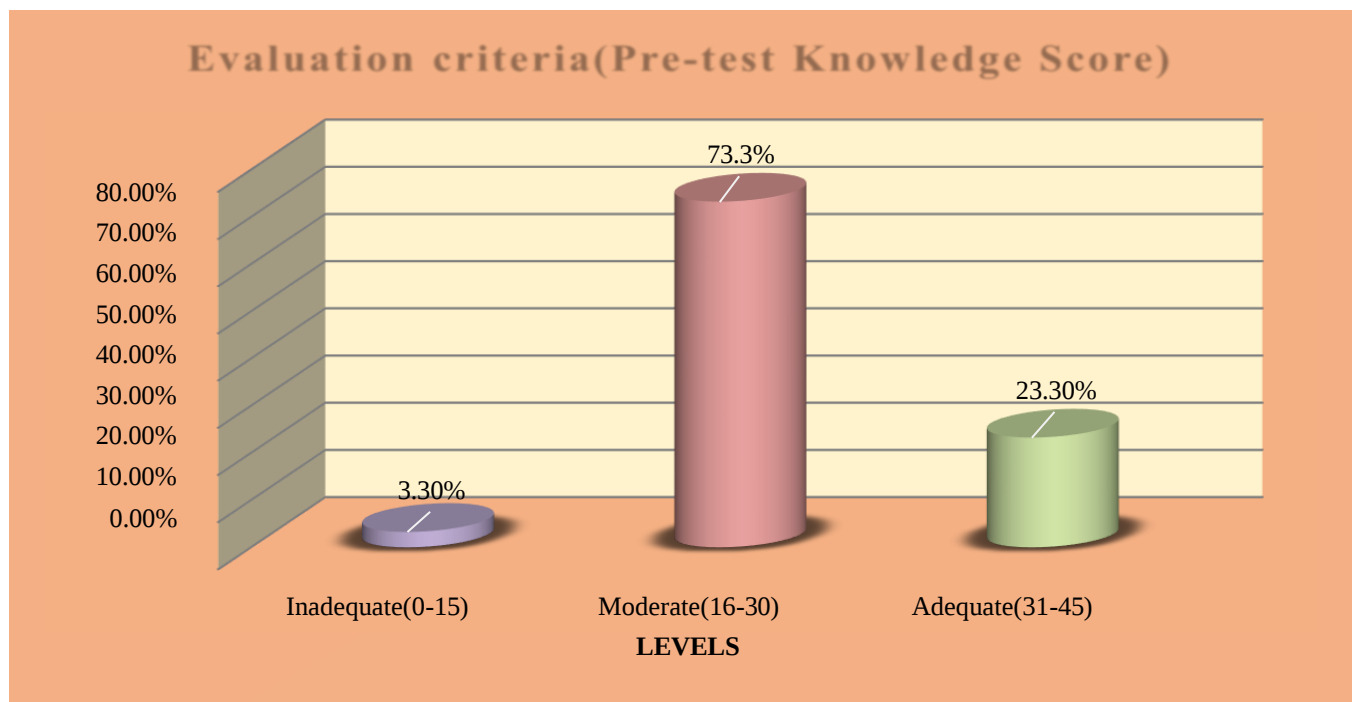


Figure 2: Percentage distribution of B.Sc. nursing 1st semester students according to pre-test knowledge level.

Section-III

Table No. 3 Distribution of level of post-test knowledge score of B.Sc. nursing 1st semester students regarding biomedical waste management.

Table no. 3 shows percentage distribution of post-test knowledge score of B.Sc. nursing 1st semester students after the intervention regarding biomedical waste management shows that majority 51(85%) of B.Sc. nursing 1st semester students had adequate knowledge score followed by 9(15%) having moderate post –test knowledge score and none of sample inadequate score regarding the biomedical waste management.

PERCENTAGE DISTRIBUTION OF POST- TEST KNOWLEDGE SCORE		
Categoryscore	Frequency	Percentage (%)
Inadequate(0-15)	0	0%
Moderate(16-30)	9	15%
Adequate(31-45)	51	85%

Maximum Score=45

Minimum Score=0

Section- IV

Table No. 4 : Comparison of Mean, S.D., Mean percentage, Range and Mean difference of pre-test and post-test knowledge scores.

N=60

TableNo.4 shows that knowledge of pre- test mean were 27.65, S.D. was 4.39, Mean percentage was 61.4% and Range was 24. Post-test knowledge score of Mean was 35.75, S.D. was 5.05, Mean percentage was 79.4% and Range was 19. Mean difference was 18%, calculated paired t value was 8.013 and tabulated t-value was 1.671.

Referring to tabulated t-value (1.671), the tabulated t-value was less than calculated t-value (8.013).As there was significant difference between mean pre-test knowledge score and mean post-test knowledge score 0.05 level of significance after administration of structured teaching programme.

CRITERIA	Mean	SD	Range	Mean %	Mean Diff.	Paired T Value	P value	df	Table value at0.05	Result
PRE-TEST KNOWLEDG E	27.65	4.39	24	61.4%	18%	8.013	0.000	59	1.671	Significant
POST-TEST KNOWLEDG E	35.75	5.05	19	79.4%						
Maximum =45 Minimum=0										

Significance level=0.05

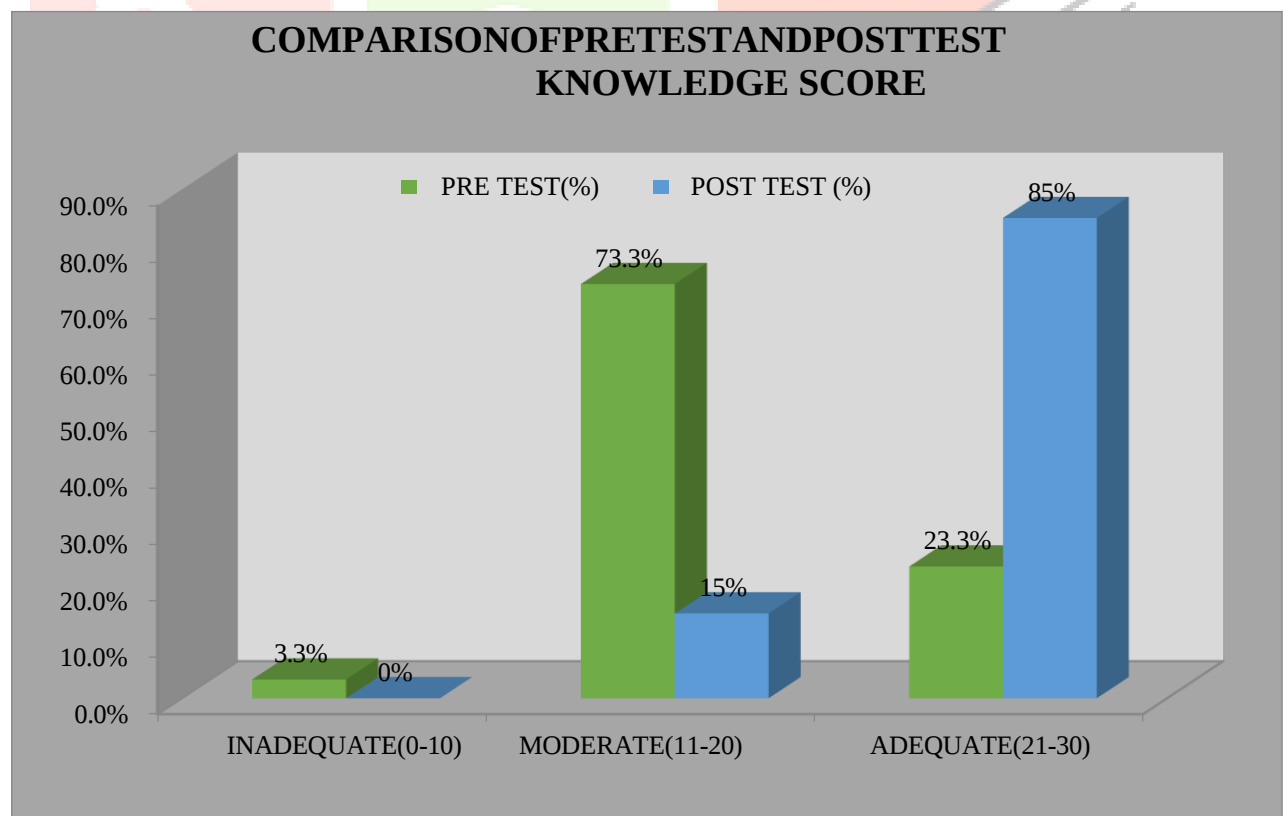


Figure no. 4: Bar graph showing level of pre-test and post-test knowledge score of B.Sc. nursing 1st semester students regarding biomedical waste management.

Section- V

Table No.5: Association of post- test knowledge score with selected socio demographic variables.

This section deals with the findings related to the association between post-test knowledge score with their selected socio-demographic variables. The Chi-square test was used to determine the association between the post-test knowledge score and selected socio-demographic variables.

Table No. 5 The findings of the study revealed that Age ($X^2=6.13$), Gender ($X^2=0.557$), do you attend any training/seminar regarding biomedical waste management ($X^2=1.39$) calculated chi square value was smaller than table value, so they had no significant association with knowledge. Thereafter, do you have knowledge regarding biomedical waste management ($X^2=4.18$) and source of information ($X^2=11.003$) Therefore, calculated chi square value was greater than table value, so it had significant association with knowledge among B.Sc. nursing 1st semester students regarding biomedical waste management.

Association of Post-test knowledge scores of B.Sc.nursing 1 st semester students with their Selected Socio-Demographic Variables.									
Variables	Options	ADEQUAT F	MODERAT F	INADEQUA TE	Chi Test	P Value	df	Table Value	Result
Age in years	18-19	29	9	0	6.13	0.047	2	5.99	Significant
	20-21	18	0	0					
	Above 21	4	0	0					
Gender	Male	3	0	0	0.557	0.455	1	3.84	Not Significant
	Female	48	9	0					
Do you have knowledge regarding Biomedical waste management?	Yes	34	9	0	4.18	0.041	1	3.84	Significant
	No	17	0	0					
Do you attend any training or seminar on Biomedical waste management?	Yes	7	0	0	1.39	0.237	1	3.84	Not Significant
	No	44	9	0					
Source of information	Journals	8	0	0	11.003	0.012	3	7.81	Significant
	E-books	21	2	0					
	Clinical	12	7	0					
	Social media	10	0	0					

V. Discussion

The present study demonstrated that a structured teaching programme significantly improved the knowledge of B.Sc. Nursing first semester students regarding biomedical waste management. The increase in post-test knowledge scores suggests that organized educational interventions are effective in enhancing students' understanding of biomedical waste segregation, colour coding, handling, transportation, treatment, and disposal.

The statistically significant difference between pre-test and post-test scores confirms that structured teaching is an effective educational strategy for improving knowledge among undergraduate nursing students. Better knowledge of biomedical waste management is expected to promote safer clinical practices, reduce occupational exposure to infectious waste, and contribute to environmental protection. These findings support the importance of incorporating regular biomedical waste management training into the nursing curriculum to ensure that future nurses develop adequate knowledge and safe waste-handling practices before entering clinical settings.

VI. Conclusion

The present study concluded that the structured teaching programme was effective in improving the knowledge of B.Sc. Nursing first semester students regarding biomedical waste management. A significant increase was observed in post-test knowledge scores when compared with pre-test scores. The calculated paired t value was higher than the tabulated t value at the 0.05 level of significance, indicating that the educational intervention had a positive impact on students' knowledge. Therefore, structured teaching programmes can be considered an effective strategy for enhancing awareness and understanding of biomedical waste management among nursing students.

VII. Recommendations

Based on the findings of the study, the following recommendations are suggested:

1. Similar studies may be conducted on a larger sample to improve generalizability.
2. Comparative studies may be undertaken among students from different nursing institutions.
3. Educational programmes on biomedical waste management should be conducted regularly for nursing students.
4. Similar studies may be replicated among staff nurses and other healthcare professionals.
5. Periodic workshops, seminars, and continuing nursing education programmes should be organized to reinforce knowledge and practices related to biomedical waste management.

VIII. Acknowledgement

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