



“A Study To Assess The Effectiveness Of Structured Teaching Programme On Knowledge Regarding Bio-Medical Waste Management Among Staff Nurses At Selected Hospital, Udaipur City”

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Abstract: The study aimed to evaluate the impact of an educational intervention on staff nurses' knowledge of biomedical waste management. The study utilized a pre-experimental one-group pre-test post-test design with a sample size of 60 staff nurses, selected using a non-probability purposive sampling technique from two hospitals in Udaipur. The objectives were to assess the pre-test and post-test knowledge scores, evaluate the effectiveness of the structured teaching program, and determine the association between pre-test knowledge scores and selected socio-demographic variables such as age, gender, qualification, and years of experience. Data were collected using a structured knowledge questionnaire consisting of 30 items. The pre-test results indicated that 90.00% of the staff nurses had average knowledge, 8.33% had poor knowledge and only 1.67% demonstrated good knowledge. After the intervention, the post-test scores revealed a significant improvement, with 75.00% of nurses achieving good knowledge and 25.00% maintaining average knowledge. The mean knowledge score increased from 15.47 (51.57%) in the pre-test to 22.30 (74.33%) in the post-test, with a mean difference of 6.83. The paired t-test value of 18.72 ($p < 0.05$) confirmed the statistical significance of the structured teaching program, supporting the hypothesis H1, which stated that there would be a significant difference in pre- and post-test scores. Furthermore, the study found a significant association between the pre-test knowledge scores and the variables of designation ($\chi^2 = 11.3$, $p < 0.05$) and area of experience ($\chi^2 = 14.33$, $p < 0.05$). However, no significant association was found with other variables like age, gender, and years of experience. The findings suggest that the structured teaching program effectively enhanced the staff nurses' knowledge of biomedical waste management, and the results highlight the need for ongoing education in this critical area of healthcare.

Index Term: Effectiveness, Structured teaching program, Bio-medical waste management, Staff nurses.

I. INTRODUCTION

Bio-medical waste is generated during medical care, including diagnosis, treatment, and immunization. According to the World Health Organization, about 85% of hospital waste is non-hazardous, while 10% is infectious and 5% is non-infectious but hazardous. The amount of regulated infectious waste can range from 15% to 35% of total hospital waste. To address these concerns, the Bio-medical Waste Management and Handling Rules were first introduced in 1998 and updated in 2016. These rules apply to all individuals and facilities involved in the generation, collection, treatment, and disposal of bio-medical waste. In 2018, further amendments strengthened the management of bio-waste, such as the phasing out of chlorinated plastic bags and gloves by 2019, excluding blood bags. Healthcare workers, especially nurses, are at risk of infection from improper bio-medical waste handling. To protect themselves and patients, nurses need to follow universal precautions and ensure the proper segregation, disposal, and treatment of waste. Raising awareness and improving knowledge about bio-medical waste management are crucial steps toward reducing health hazards and ensuring a safer environment.

Biomedical waste is highly hazardous to both the public and the environment, requiring careful management. Local governments regulate biomedical waste treatment facilities to ensure public protection from contamination. Nurses play a crucial role in waste management, and their health and safety are paramount. Adequate training is essential to equip them with the necessary skills for safe practices. In India, improper handling and disposal of biomedical waste can lead to the transmission of infectious diseases, especially among healthcare workers, waste operators, and scavengers. Effective waste management requires cooperation among all involved, from healthcare staff to disposal operators. Inadequate practices, such as allowing access to waste by unauthorized individuals, can break the safety chain and result in health risks. Globally, around 20% of healthcare waste is hazardous, potentially causing infection, pollution, and disease if mishandled. A study on nurses in Delhi highlighted that their knowledge of biomedical waste risks was low, but post-training, significant improvement was observed.

The investigator noted unsafe biomedical waste practices among nurses, increasing their exposure to risks. Proper waste management through segregation, storage, transportation, and disposal is essential. Improved knowledge and training in healthcare waste management are needed to reduce risks and ensure the safety of healthcare workers and the community.

1.1. PROBLEM STATEMENT

“A Study To Assess The Effectiveness Of Structured Teaching Programme On Knowledge Regarding Bio-Medical Waste Management Among Staff Nurses At Selected Hospital , Udaipur City.”

1.2. OBJECTIVES

- To assess the pre-test knowledge scores regarding bio-medical waste management among staff nurses.
- To assess the post-test knowledge score regarding bio-medical waste management among staff nurses.
- To evaluate the efficacy of structured teaching programme on knowledge regarding bio-medical waste management among staff nurses.
- To find out association between pre-test knowledge scores regarding biomedical waste management among staff nurses with selected socio-demographic variable.

1.3. HYPOTHESIS

H₀:-There will be no significant difference between pre-test & post-test knowledge score regarding bio-medical waste management among staff nurses

H₁:- There will be significant difference between the pre-test & post-test knowledge regarding bio-medical waste management among staff nurses

H₂:- There will be significant association between pre-test knowledge regarding biomedical waste management among staff nurses.

1.4. CONCEPTUAL FRAMEWORK

Conceptualization involves developing and refining abstract ideas, while a theoretical framework consists of defined concepts and relationships to systematically examine phenomena. In this study, the conceptual framework is based on General Systems Theory by Bertalanffy, which focuses on how discrete parts interact to form an organized whole.

The study assesses the effectiveness of a structured teaching program on biomedical waste management among staff nurses. In this framework:

- **Input:** Includes demographic variables such as age, sex, qualification, experience, and prior knowledge of biomedical waste management.
- **Throughput:** Refers to the structured teaching program delivered to staff nurses using flashcards.
- **Output:** Measures post-test knowledge levels (Good, Average, Poor) regarding biomedical waste management.
- **Feedback:** Evaluates the change in knowledge levels, indicating the effectiveness of the program.

This system evaluates how the teaching program impacts nurses' knowledge of biomedical waste management.

1.5. VARIABLES

A variable is a characteristic or attribute that differs among staff nurses.

- **Dependent Variable:** In this study, dependent variable is level of knowledge of staff nurses.
- **Independent Variable:** In this study, independent variable is structured teaching programme.
- **Demographic Variable:** In this study the selected demographic variables are age in years, gender, qualification, designation, area of experience, years of experience, did you receive any information regarding biomedical waste management, and source of information.

1.6. DELIMITATIONS

- The sample size is limited to 60 staff nurses.
- The period of study will be limited to one month
- This study is limited to only select hospitals at Udaipur.

II. MATERIALS AND METHOD

2.1. Research Approach: A quantitative evaluative approach was used in the study.

2.2. Research Design: Pre-experimental (One group pretest posttest) research design was used.

2.3. Sample: The sample comprises 60 staff nurses

2.4. Sampling Technique: The samples were selected through a non-probability purposive sampling technique.

2.5. Criteria for Sample Selection

❖ **Inclusion criteria:**

- Staff nurses working for selected Hospital, Udaipur.
- Staff nurses who are willing to participate in the study.
- Staff nurses Available at the time of data collection.
- Children who can read and write English or Hindi.

❖ Exclusion criteria:

- Staff nurses who are on leave
- Staff nurses who are not willing to participate in this study.
- Staff nurses who are not fill consent form.

2.6. Setting: The setting selected for study was JK Paras Hospital & Pacific Institute of Medical Sciences Umarda at Udaipur.

2.7. Population: The population was staff nurses working in selected hospital at Udaipur.

2.8. Description of tool: It consisted of two parts:

Part-A: Demographic Variables: This consists of demographic variables such as age in years, gender, qualification, designation, area of experience, years of experience, did you receive any information regarding biomedical waste management, and source of information.

Part-B: Structured Knowledge Questionnaire: This consists of knowledge questionnaire regarding bio-medical waste management among staff nurses. This section consists of 30 knowledge questionnaires on selected aspects.

2.9. Ethical consideration:

Ethical clearance was obtained from ethical committee from Venkateshwar College of Nursing Reference No. VCN/UDR/2023/029. Permission to conduct research study was obtained from the JK Paras Hospital at Udaipur.

2.10. Plan for data analysis: The data analyses were done according to the study objectives by using descriptive and inferential statistics. The plans of data analysis were as follows:

- Frequency, percentage, mean, and standard deviation will be calculated.
- The t-test will be used for the assessment of comparison between pre-test and post-test level of knowledge.
- The chi-square test will be used for association with demographic variables.

III. RESULTS

The data obtained are divided into sections for easy and accurate interpretation of data. The data finding has organized under the following section:

Section - I: Distribution of staff nurses based on their demographic variables.

Section - II: Distribution of staff nurses based on their level of knowledge score regarding bio-medical waste management.

Section - III: Evaluation of the effectiveness of structured teaching program on level of knowledge regarding bio-medical waste management among staff nurses.

Section - IV: Association between pre-test level of knowledge scores with selected demographic variables.

SECTION - I: Distribution of staff nurses based on their demographic variables:

The demographic data consists of 08 items seeking information about the age in years, gender, qualification, designation, area of experience, years of experience, did you receive any information regarding biomedical waste management, and source of information.

Table-1: Description of demographic variables of staff nurses

N = 60

S. N.	DEMOGRAPHIC VARIABLE		FREQUENCY (N)	PERCENTAGE (%)
1	Age in Years	20-23 Years	0	0.00
		24-27 Years	16	26.67
		28-30 Years	24	
		31 Years & above	20	33.33
Total			60	100.00
2	Gender	Male	22	36.67
		Female	38	63.33
Total			60	100.00
3	Qualification	ANM	20	33.33
		GNM	26	43.33
		DMLT	8	13.33
		B.Sc. Nursing	6	10.00
Total			60	100.00
4	Designation	Staff Nurses	32	53.33
		Health Workers	11	18.33
		Lab technician	8	13.33
		Health Assistant	9	15.00
Total			60	100.00
5	Area of Experience	OPD	17	28.33
		MCH & FM	26	43.33
		Minor OT	9	15.00
		Pathology	8	13.33
Total			60	100.00
6	Years of Experience	0-2 years	0	0.00
		3-5 years	20	33.33
		6-8 years	28	46.67
		> 8 years	12	20.00
Total			60	100.00
7	Did you receive any information regarding biomedical waste management	Yes	44	73.33
		No	16	26.67
Total			60	100.00
8	Sources of Information	Health professionals	38	63.33
		Mass Media	12	20.00
		In-service Education	10	16.67
Total			60	100.00

- In terms of age, the largest group of participants was between 28-30 years old, accounting for 24 nurses (40%). This was followed by nurses aged 31 years and above, representing 20 participants (33.33%). A smaller portion, 16 nurses (26.67%), was in the 24-27 years age group, while none of the nurses were in the 20-23 years age category.
- Regarding gender, the majority of the participants were female, with 38 nurses (63.33%) identifying as such, while male nurses made up 22 participants (36.67%).
- Concerning qualifications, most of the nurses held a General Nursing and Midwifery (GNM) diploma, with 26 nurses (43.33%) having this qualification. Another significant portion, 20 nurses (33.33%), had an Auxiliary Nurse Midwife (ANM) certification. Fewer participants held a Diploma in Medical Laboratory Technology (DMLT), with 8 nurses (13.33%) holding this qualification, and only 6 nurses (10%) had completed a B.Sc. in Nursing.

- When looking at designation, more than half of the participants, 32 nurses (53.33%), were designated as Staff Nurses. This was followed by Health Workers, comprising 11 nurses (18.33%). There were 9 nurses (15%) working as Health Assistants, and 8 nurses (13.33%) were designated as Lab Technicians.
- In terms of area of experience, most nurses had experience in Maternal and Child Health (MCH) & Family Medicine (FM), with 26 participants (43.33%) working in this area. Outpatient Department (OPD) experience was reported by 17 nurses (28.33%). A smaller group, 9 nurses (15%), worked in Minor OT, and 8 nurses (13.33%) were experienced in Pathology.
- When it came to years of experience, nearly half of the nurses, 28 participants (46.67%), had 6-8 years of experience. This was followed by 20 nurses (33.33%) with 3-5 years of experience. A smaller group, 12 participants (20%), had more than 8 years of experience, while none of the nurses had fewer than 2 years of experience.
- In response to whether they had received any information regarding biomedical waste management, the majority of nurses, 44 participants (73.33%), had received such information, whereas 16 nurses (26.67%) had not.
- Lastly, for those who had received information, the primary source of information was Health Professionals, reported by 38 nurses (63.33%). Mass Media was cited as the source by 12 participants (20%), while 10 nurses (16.67%) mentioned receiving information through In-service Education.

SECTION - II: Distribution of staff nurses based on their level of knowledge score regarding bio-medical waste management:

This section deals with analysis and interpretation of collected data to find out the knowledge scores of participants before and after, giving the intervention on bio-medical waste management among staff nurses.

Table-2: Frequency and percentage distribution of staff nurses by the level of knowledge score.

N = 60

Level of knowledge	Pre-test		Post-test	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Poor Knowledge	5	8.33	0	0.00
Average Knowledge	54	90.00	15	25.00
Good Knowledge	1	1.67	45	75.00
Total	60	100.00	60	100.00

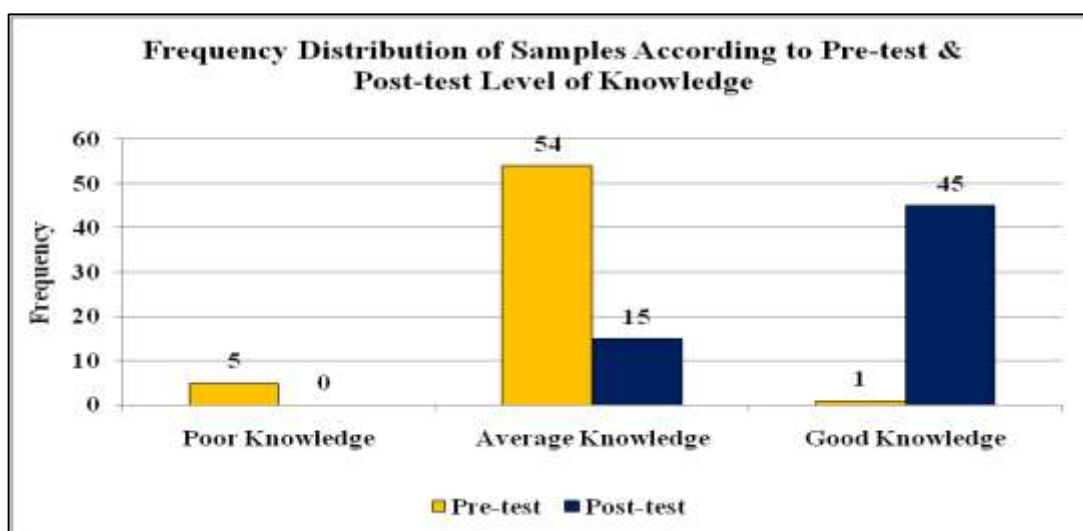


Figure-1: Frequency Distribution of Samples According to Pre-test & Post-test Level of Knowledge

The data presented in Table-2 outlines the distribution of staff nurses based on their level of knowledge regarding biomedical waste management before and after the intervention. In the pre-test assessment, the majority of the staff nurses exhibited an average level of knowledge, with 54 nurses (90%) falling into this category. Only 5 nurses (8.33%) demonstrated poor knowledge, while just 1 nurse (1.67%) displayed good knowledge prior to the structured teaching program. Following the intervention, a significant improvement in knowledge was observed in the post-test results. The percentage of staff nurses with good knowledge increased dramatically to 45 nurses (75%). Additionally, 15 nurses (25%) were found to have average knowledge, while none of the nurses (0%) scored in the poor knowledge category after the intervention. These findings suggest that the structured teaching program was highly effective in improving the knowledge levels of staff nurses regarding biomedical waste management, as demonstrated by the marked increase in the number of nurses achieving good knowledge post-intervention.

SECTION III: Evaluation of the effectiveness of structured teaching program on level of knowledge regarding bio-medical waste management among staff nurses:

This section interprets the description of the evaluation of the effectiveness of structured teaching program on level of knowledge regarding bio-medical waste management among staff nurses.

Table-3: Effectiveness of structured teaching program on level of knowledge score regarding bio-medical waste management among staff nurses

N = 60

Group	Test	Mean	Mean (%)	SD	Mean Difference	Mean Difference (%)	df	Paired 't' Test	Inference (P Value = 0.05)
One Group	Pre test	15.47	51.57	2.93	6.83	22.77	59	18.72	S** (2.00)
	Post test	22.30	74.33	3.06					

S = Significant

The effectiveness of the structured teaching program on the level of knowledge regarding biomedical waste management among staff nurses. According to Table-3, the pre-test results indicate that staff nurses had a mean knowledge score of 15.47 (mean percentage: 51.57%, SD: 2.93), suggesting a moderate level of knowledge prior to the intervention. After implementing the structured teaching program, the post-test results show a significant increase in the mean knowledge score to 22.30 (mean percentage: 74.33%, SD: 3.06), reflecting a marked improvement in knowledge. The mean difference between pre-test and post-test scores was 6.83, with a mean difference percentage of 22.77%, demonstrating that the program effectively enhanced knowledge among the staff nurses. Additionally, the paired 't' test value was 18.72, which is considerably higher than the critical value of 2.00 at df = 59. Since the p-value is less than 0.05, the results are statistically significant (S = Significant), indicating that the structured teaching program successfully improved the knowledge of staff nurses regarding biomedical waste management.

SECTION IV: Association between pre-test level of knowledge scores with selected demographic variables:

This section deals with analysis and interpretation of the data collected to find out the association between the pre-test level of knowledge score with selected demographic variables such as age in years, gender, qualification, designation, area of experience, years of experience, did you receive any information regarding biomedical waste management, and source of information. The parametric chi square test was used to describe the association between pre-test level of knowledge score with selected demographic variables.

Table 4: Association between pre-test level of knowledge score with demographic variables**N = 60**

S. N.	Demographic Variable	df	Tabulated value (0.05 level)	Calculated Chi-square (χ^2)	Inference
1	Age in Years	3	7.815	1.37	NS
2	Gender	1	3.841	0.29	NS
3	Qualification	3	7.815	4.12	NS
4	Designation	3	7.815	11.3	S
5	Area of experience	3	7.815	14.33	S
6	Years of experience	3	7.815	0.48	NS
7	Did you receive any information regarding biomedical waste management	1	3.841	1.36	NS
8	Source of Information	2	5.991	1.81	NS

S = Significant or NS = Non Significant

Table-4 examines the association between pre-test knowledge scores regarding biomedical waste management and various demographic variables among staff nurses. The analysis aimed to identify whether factors such as age, gender, qualification, designation, area of experience, years of experience, prior information received about biomedical waste management, and sources of information correlate with the knowledge scores. A parametric chi-square test was employed to evaluate these associations.

The findings indicated that for age in years, the calculated chi-square (χ^2) value was 1.37 with 3 degrees of freedom (df), which was lower than the tabulated value of 7.815 at the 0.05 level of significance, indicating a non-significant association (NS) with a p-value > 0.05 . Similarly, for gender, the chi-square (χ^2) value of 0.29 (df = 1) was less than the critical value of 3.841, also signifying a non-significant association (NS) with a p-value > 0.05 . Regarding qualification, the calculated chi-square (χ^2) value of 4.12 (df = 3) remained below the tabulated value of 7.815, indicating a non-significant association (NS) with a p-value > 0.05 . In contrast, the designation showed a significant association with a chi-square (χ^2) value of 11.3 (df = 3), which exceeded the tabulated value of 7.815 (S) with a p-value < 0.05 . The area of experience also demonstrated a significant association, with a chi-square (χ^2) value of 14.33 (df = 3), surpassing the critical value of 7.815 (S) with a p-value < 0.05 . However, the analysis for years of experience yielded a chi-square (χ^2) value of 0.48 (df = 3), indicating a non-significant association (NS) with a p-value > 0.05 . Similarly, for the question regarding whether participants received any information about biomedical waste management, the chi-square (χ^2) value of 1.36 (df = 1) was below the critical value of 3.841 (NS) with a p-value > 0.05 . Lastly, the source of information showed a chi-square (χ^2) value of 1.81 (df = 2), which is less than the tabulated value of 5.991, indicating a non-significant association (NS) with a p-value > 0.05 .

In summary, the analysis revealed that while designation ($\chi^2 = 11.3$, df = 3, $p < 0.05$) and area of experience ($\chi^2 = 14.33$, df = 3, $p < 0.05$) exhibited significant associations with pre-test knowledge scores, other demographic variables such as age, gender, qualification, years of experience, prior information received, and source of information showed no significant relationships (all with $p > 0.05$).

IV. DISCUSSION

The discussion delves into the effectiveness of a structured teaching program on staff nurses' knowledge regarding biomedical waste management. The research objectives were clearly defined, focusing on assessing the pre-test and post-test knowledge scores, evaluating the efficacy of the teaching program, and examining the association between pre-test knowledge scores and selected socio-demographic variables. The conceptual framework of the study was based on General Systems Theory, which facilitated a comprehensive analysis of how the structured teaching program impacted nurses' knowledge. The framework delineated the educational intervention into input (demographic variables), throughput (the teaching program), output (post-test knowledge levels), and feedback (evaluation of knowledge change). In

this study, the dependent variable was the level of knowledge of staff nurses, while the independent variable was the structured teaching program.

In the analysis of the knowledge scores among staff nurses, a notable improvement was observed following the structured teaching program. Prior to the intervention, 54 nurses (90.00%) exhibited average knowledge, 5 nurses (8.33%) had poor knowledge, and only 1 nurse (1.67%) demonstrated good knowledge. Post-intervention, the scenario changed dramatically, with 45 nurses (75.00%) attaining good knowledge, 15 nurses (25.00%) maintaining average knowledge, and none recording poor knowledge. This significant shift in knowledge levels supports the hypothesis H1, which posits a significant difference between pre-test and post-test knowledge scores ($p < 0.05$). The findings underscore the effectiveness of the structured teaching program in enhancing the understanding of biomedical waste management among staff nurses. The effectiveness of the structured teaching program was further evaluated using descriptive statistics, including mean scores, standard deviation, and paired t-tests. The pre-test mean knowledge score was 15.47 (51.57%) with a standard deviation of 2.93, while the post-test mean score rose significantly to 22.30 (74.33%), with a standard deviation of 3.06. The mean difference of 6.83 (59%) between the pre-test and post-test scores, along with a paired t-test value of 18.72 ($p < 0.05$), confirms the statistical significance of the teaching intervention. This substantial increase in knowledge scores underscores the positive impact of the structured program on staff nurses, validating hypothesis H1 regarding the effectiveness of the intervention. The engaging methods utilized, such as flashcards and interactive discussions, likely contributed to improved retention and understanding of critical concepts related to biomedical waste management. The study also investigated the association between pre-test knowledge scores and selected demographic variables using the chi-square test. The results indicated that certain demographic factors were significantly associated with pre-test knowledge levels. Specifically, the designation of staff nurses ($\chi^2 = 11.3$, $df = 3$, $p < 0.05$) and their area of experience ($\chi^2 = 14.33$, $df = 3$, $p < 0.05$) demonstrated significant associations with knowledge scores. Conversely, variables such as age, gender, qualification, years of experience, whether they received prior information about biomedical waste management, and the source of this information showed no significant associations (all with $p > 0.05$). These findings emphasize the importance of professional designation and experience in influencing knowledge levels, suggesting that more experienced or higher-designated staff nurses may possess better baseline knowledge regarding biomedical waste management. This supports hypothesis H2, indicating a significant association between pre-test knowledge scores and demographic variables.

Despite the significant findings, the study has some limitations, including a sample size limited to 60 staff nurses and one-month duration for data collection, which may affect the generalizability of the results. Additionally, the research was confined to selected hospitals in Udaipur, further restricting the applicability of the findings. In conclusion, the structured teaching program markedly enhanced the knowledge of biomedical waste management among staff nurses, as evidenced by the improved post-test scores and statistical significance. The associations found between demographic variables and pre-test knowledge scores underscore the necessity for tailored educational strategies to meet the diverse needs of nursing staff. Future research could investigate the longitudinal impacts of such educational interventions on nursing practice and patient outcomes, ultimately contributing to the continuous improvement of biomedical waste management in healthcare settings.

V. CONCLUSION

In conclusion, the structured teaching program effectively improved staff nurses' knowledge regarding biomedical waste management. The findings underscore the importance of targeted educational interventions in promoting informed media consumption habits among children, contributing to their overall well-being.

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