Advanced International Journal for Research (AIJFR)
E-ISSN: 3048-7641 ● Website: www.aijfr.com ● Email: editor@aijfr.com

A Study to Assess the Effectiveness of Structured Teaching Program On Knowledge Regarding Management of Patients with Organophosphorus Poisoning Among III Year B.Sc. Nursing Students at Selected Colleges of Nursing, Mysore

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Abstract

Background: Organophosphorus (OP) poisoning is a major public health concern in developing countries and requires prompt and effective management. Nurses play a crucial role in early recognition and emergency care; however, knowledge gaps may affect optimal patient outcomes.

Objective: To evaluate the effectiveness of a structured teaching programme on knowledge regarding the management of organophosphorus poisoning among undergraduate nursing students.

Methods: A pre-experimental one-group pre-test and post-test design was conducted among 60 B.Sc. Nursing students selected through convenient sampling from a nursing institution in India. Baseline knowledge was assessed using a validated structured questionnaire. Following the pre-test, a structured teaching programme on organophosphorus poisoning management was delivered. Post-test assessment was conducted using the same tool. Data were analyzed using SPSS version 29.0. Descriptive statistics summarized demographic variables and knowledge scores, and a paired t-test was applied to determine the effectiveness of the intervention.

Results: Pre-test findings revealed that 38% of students had poor knowledge, 33% had average knowledge, and 29% had good knowledge, with none demonstrating very good knowledge. The mean pre-test score was 13.83 (SD = 0.67). Post-intervention, no participant remained in the poor category; 43% achieved good knowledge and 30% attained very good knowledge. The mean post-test score

increased to 17.95 (SD = 2.77), with a mean difference of 4.12. The improvement was statistically highly significant ($t = 13.37$, $p < 0.001$).

Conclusion: The structured teaching programme significantly improved nursing students' knowledge regarding the management of organophosphorus poisoning. Incorporating structured educational interventions into nursing curricula may enhance preparedness for toxicological emergencies.

Keywords: Organophosphorus poisoning; Structured teaching programme; Nursing students; Knowledge assessment; Toxicological emergencies; Educational intervention.

1. Introduction:

Poisoning remains a major public health concern worldwide and contributes substantially to morbidity and mortality across both developed and developing nations. According to the World Health Organization (WHO), approximately three million cases of acute poisoning occur globally each year, resulting in nearly 220,000 deaths, the majority of which occur in developing countries (1). Among various toxic exposures, pesticide poisoning particularly organophosphorus (OP) compound poisoning accounts for a significant proportion of fatal and non-fatal cases. The widespread availability and agricultural use of these compounds, especially in rural regions, have contributed to their high incidence in intentional and accidental poisoning events (2).

Organophosphorus compounds are extensively used in agriculture for pest control due to their high efficacy and low cost. However, their mechanism of toxicity makes them potentially lethal. OP compounds exert their toxic effects by inhibiting acetylcholinesterase (AChE), leading to the accumulation of acetylcholine at synaptic junctions and resulting in continuous stimulation of muscarinic, nicotinic, and central nervous system receptors (3). Clinically, patients may present with salivation, lacrimation, urination, diarrhea, bronchospasm, bradycardia, muscle weakness, seizures, and respiratory failure. Among these complications, respiratory failure remains the leading cause of mortality (4). Early recognition and prompt management are therefore critical to reducing fatal outcomes.

In India, pesticide poisoning accounts for a considerable proportion of hospital admissions related to toxic exposure. Studies indicate that organophosphorus poisoning constitutes more than 60% of pesticide poisoning cases in several regions of the country (5). Young adults, particularly those in the economically productive age group, are disproportionately affected (6). The high mortality rate associated with delayed treatment underscores the importance of rapid assessment, appropriate antidote administration (such as atropine and pralidoxime), airway management, and intensive monitoring (7). Nurses play a pivotal role in the management of patients with organophosphorus poisoning. Their responsibilities include early identification of symptoms, continuous monitoring of vital parameters, administration of antidotes, prevention of complications, ventilatory support, and patient education. Effective nursing care requires sound theoretical knowledge and clinical competence. Inadequate knowledge among nursing students may compromise patient safety and delay critical interventions (8). Given that nursing students are future frontline healthcare providers, strengthening their knowledge base through structured educational interventions is essential.

Educational strategies such as Structured Teaching Programmes (STPs) have been widely used to enhance knowledge and clinical competencies among healthcare students. Research evidence suggests that planned educational interventions significantly improve knowledge levels and confidence in managing clinical emergencies (9). However, limited studies have specifically focused on enhancing nursing students' knowledge regarding the management of organophosphorus poisoning. Considering the high incidence and clinical severity of OP poisoning in India, targeted educational interventions are warranted.

During clinical postings, it was observed that many III year B.Sc. Nursing students demonstrated gaps in knowledge related to assessment, pharmacological management, supportive care, and complication prevention in OP poisoning cases. This observation highlighted the need for a structured and systematic educational approach to improve their understanding and preparedness.

Therefore, the present study was undertaken to assess the effectiveness of a Structured Teaching Programme on knowledge regarding the management of patients with organophosphorus poisoning among III year B.Sc. Nursing students in selected colleges of nursing at Mysore. The objectives of the study were: (1) to assess the pre-test knowledge regarding management of patients with OP poisoning; (2) to evaluate the effectiveness of the structured teaching programme by comparing pre-test and post-test knowledge scores; and (3) to determine the association between pre-test knowledge scores and selected demographic variables. Enhancing knowledge through structured educational interventions is expected to strengthen clinical competence, improve patient outcomes, and ultimately contribute to reducing mortality associated with organophosphorus poisoning.

2. Methodology

A pre-experimental one-group pre-test and post-test design was employed to evaluate the effectiveness of a structured teaching programme (STP) on knowledge regarding organophosphorus poisoning among undergraduate nursing students. The study was conducted in the Nursing Department of a selected institution in India after obtaining institutional and ethical approval.

The study population comprised undergraduate nursing students who were present during the data collection period and consented to participate. A total of 60 students were recruited using a non-probability convenient sampling technique. Students who were absent during either the pre-test or post-test phase were excluded from the analysis.

Data were collected using a structured self-administered questionnaire developed following an extensive literature review and expert validation. The instrument consisted of two sections: demographic characteristics (age, gender, year of study, and prior exposure to emergency care training) and a multiple-choice knowledge questionnaire covering definition, etiology, pathophysiology, clinical manifestations, emergency management, antidote therapy, nursing interventions, complications, and preventive measures of organophosphorus poisoning. Each correct response was awarded one mark, with higher scores indicating better knowledge. The tool's content validity was established by experts in medical-surgical nursing and toxicology, and reliability was confirmed using appropriate statistical testing.

Baseline knowledge was assessed through a pre-test. Immediately thereafter, participants received a structured teaching programme delivered through lecture, PowerPoint presentation, and interactive discussion. The session lasted approximately 45–60 minutes and emphasized mechanism of toxicity, early recognition of symptoms, emergency management protocols, antidote administration (atropine and pralidoxime), and nursing responsibilities in monitoring and supportive care. A post-test using the same questionnaire was administered after a specified interval to evaluate knowledge gain. Data were coded and analyzed using the Statistical Package for Social Sciences (SPSS) version 29.0. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to summarize demographic variables and knowledge scores. The effectiveness of the intervention was assessed using the paired t-test to compare pre- and post-test mean scores. The chi-square test was applied to examine associations between post-test knowledge levels and selected demographic variables. A p-value of <0.05 was considered statistically significant. Confidentiality and anonymity of participants were maintained throughout the study, and informed consent was obtained prior to data collection.

3. Result

This chapter presents the findings of the study evaluating the effectiveness of the structured teaching programme on knowledge regarding organophosphorus poisoning among undergraduate nursing students. Data were analyzed using SPSS version 29.0. Descriptive statistics were used to summarize demographic characteristics and knowledge scores, while inferential statistics were applied to determine the effectiveness of the intervention. Pre-test findings indicated varying levels of baseline knowledge among participants. Following the structured teaching programme, an improvement in post-test knowledge scores was observed. Statistical comparison of pre- and post-test scores demonstrated a significant increase in mean knowledge scores, indicating the effectiveness of the educational intervention. Associations between post-test knowledge levels and selected demographic variables were also examined.

Table- 1: Distribution of frequency and percentage analysis of selected variables

SL No	Demographic variables	Variables	No of subjects	Percentage
1	Age(in years)	19- 21	35	58%
		21-22	25	42%
		Above 24	0	0%
2	Gender	Male	18	30%
		Female	42	70%
3	Marks obtained in 2nd year B.Sc Nursing	51 to 60	22	37%
		61-70	21	35%
		Above 70	17	28%

4.	Previous knowledge on management of patients with OP poisoning	Yes	60	100%
		No	0	0%
5.	Previous exposure to OP poisoning clients	Yes	48	80%
		No	12	20%

Table 1 presents the distribution of demographic characteristics of the 60 nursing students included in the study. With respect to age, the majority of participants (58%) were between 19–21 years, while 42% were between 21–22 years. None of the participants were above 24 years of age. This indicates that the sample primarily consisted of young undergraduate students within the typical age range for B.Sc. Nursing education. In terms of gender distribution, females constituted the majority of the sample (70%), whereas males accounted for 30%. This reflects the commonly observed gender distribution in nursing education programs. Regarding academic performance in the second year of B.Sc. Nursing, 37% of students had secured marks between 51–60%, 35% obtained 61–70%, and 28% scored above 70%. This suggests that the majority of participants had moderate to good academic performance.

All participants (100%) reported having previous knowledge regarding the management of patients with organophosphorus poisoning. Additionally, 80% of students had prior exposure to clients with organophosphorus poisoning during their clinical postings, while 20% had no such exposure.

Overall, the table indicates that most participants had prior awareness and some level of clinical exposure to organophosphorus poisoning, which is important when interpreting pre-test knowledge levels and post-intervention outcomes.

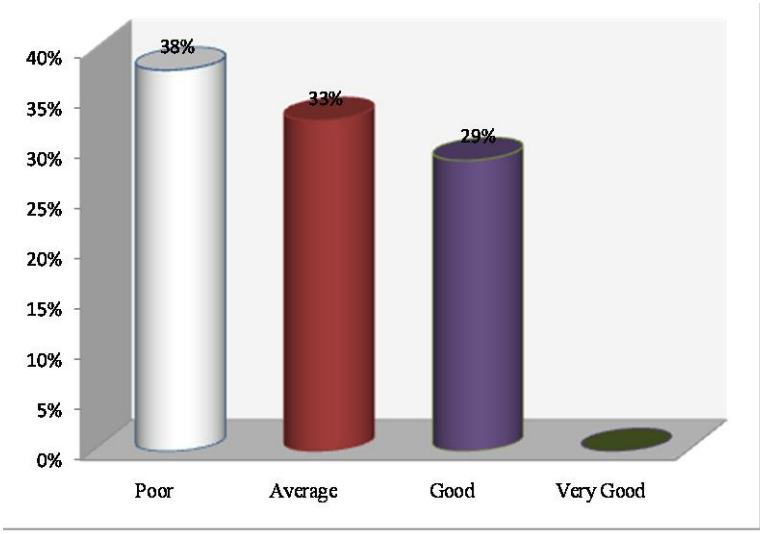

Figure:1 Diagram representing distribution of samples based on pretest knowledge score

Figure 1 illustrates the distribution of participants based on their pre-test knowledge scores regarding the management of patients with organophosphorus poisoning.

The findings reveal that the majority of students (38%) demonstrated poor knowledge prior to the structured teaching programme. Approximately 33% of participants had an average level of knowledge, while 29% were categorized under good knowledge. Notably, none of the students achieved a very good knowledge score in the pre-test assessment. These results indicate that although all participants reported having previous knowledge of organophosphorus poisoning, a considerable proportion lacked adequate understanding of its management. The predominance of poor and average knowledge levels highlights the need for a structured educational intervention to enhance theoretical and clinical understanding among nursing students.

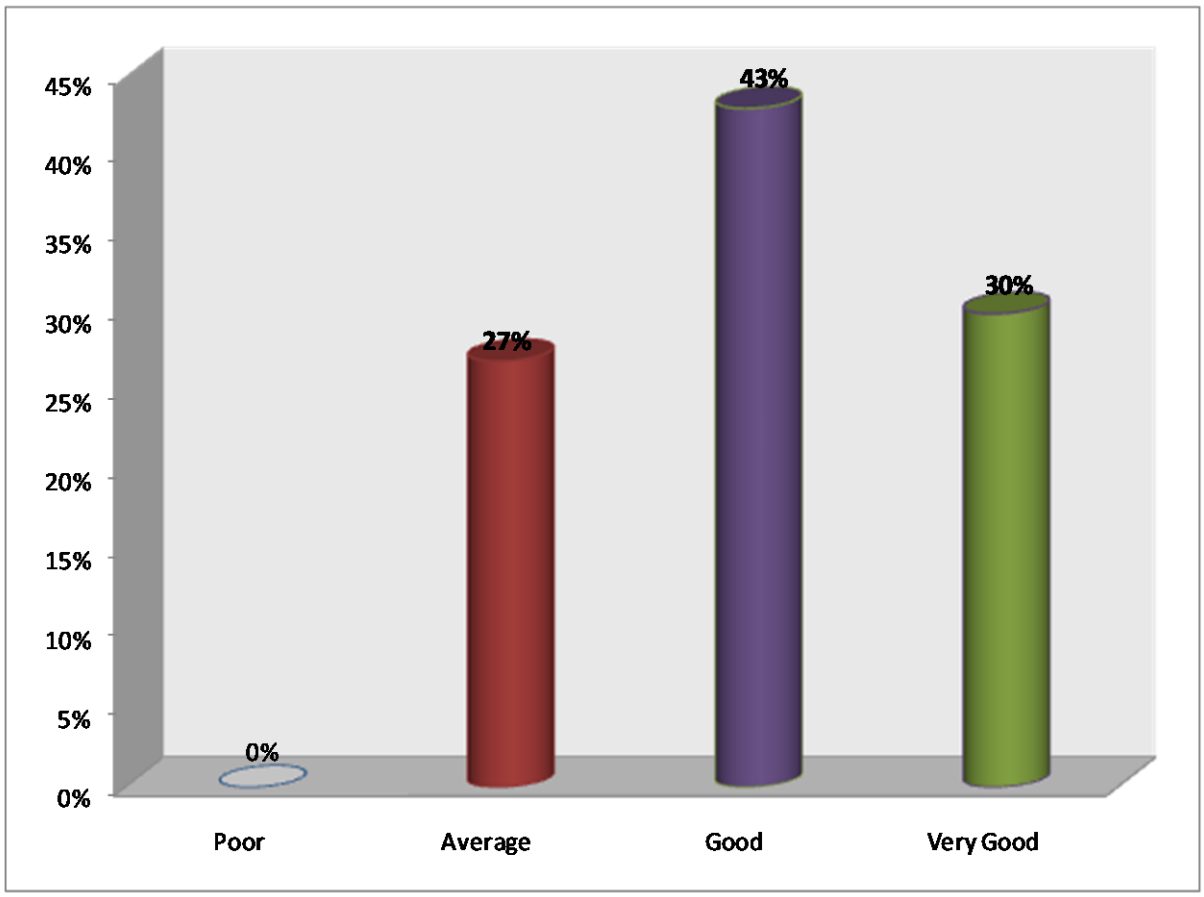

Figure: 2 Diagram representing distribution of samples based on posttest knowledge score

Figure 2 depicts the distribution of participants based on their post-test knowledge scores following the implementation of the structured teaching programme on the management of patients with organophosphorus poisoning. The results demonstrate a marked improvement in knowledge levels compared to the pre-test findings. None of the participants (0%) were categorized under poor knowledge in the post-test assessment. A smaller proportion (27%) had average knowledge, while the majority of students achieved good (43%) and very good (30%) knowledge levels.

The shift from predominantly poor and average knowledge in the pre-test to good and very good knowledge in the post-test indicates a substantial enhancement in understanding after the educational intervention. The complete elimination of the poor knowledge category further emphasizes the effectiveness of the structured teaching programme.

Table 2: Effectiveness of structured teaching program						
Knowledge assessment	Mean	Mean difference	SD	Df	Paired 't' value	P value
Pre test	13.83	4.12	0.67	59	13.37	<0.001
Post test	17.95		2.77			

Table 2 presents the analysis of the effectiveness of the structured teaching programme by comparing pre-test and post-test knowledge scores using a paired t-test. The mean pre-test knowledge score was 13.83 (SD = 0.67), whereas the mean post-test score increased to 17.95 (SD = 2.77). The mean difference between pre-test and post-test scores was 4.12, indicating a substantial improvement in knowledge following the intervention. The calculated paired t-value was 13.37 with 59 degrees of freedom, and the corresponding p-value was <0.001, which is statistically highly significant. Since the p-value is less than the conventional level of significance ($p < 0.05$), the null hypothesis was rejected. These findings confirm that the structured teaching programme was highly effective in improving the knowledge of nursing students regarding the management of patients with organophosphorus poisoning. The significant increase in post-test scores demonstrates the positive impact of the educational intervention.

Table 3: Association between pre-test knowledge score and selected demographic variables								
Sl. No.	Variables		Poor	Average	Good	df	Table value	$\chi 2$
1	Age(in years)	19-21	15	13	7	2	5.99	4.57 NS
		21-22	8	7	10			
2	Gender	Male	6	5	7	2	5.99	1.6 NS
		Female	17	15	10			
3	Marks obtained in 2nd year B.Sc Nursing	51to 60	10	6	6	4	9.49	1.8 NS
		61 to 70	7	9	5			
		Above 70	6	5	6			
4	Previous knowledge on management of patients with OP poisoning	Yes	15	14	12	2	5.99	0.27 NS
		No	8	6	5			
5	Previous exposure to OP poisoning clients	Yes	15	13	10	2	5.99	0.20 NS
		No	8	7	7			

Table 3 presents the association between pre-test knowledge scores and selected demographic variables using the chi-square (χ^2) test. With regard to age, among students aged 19–21 years, 15 had poor, 13 had average, and 7 had good knowledge scores. Among those aged 21–22 years, 8 had poor, 7 had average, and 10 had good knowledge. The calculated chi-square value was 4.57, which is less than the table value of 5.99 at 2 degrees of freedom. This indicates that there was no statistically significant association between age and pre-test knowledge level. Similarly, no significant association was observed between gender and pre-test knowledge ($\chi^2 = 1.6$; df = 2; table value = 5.99). Both male and female students demonstrated comparable distributions of knowledge levels.

Academic performance in the second year B.Sc. Nursing also showed no significant association with pre-test knowledge ($\chi^2 = 1.8$; df = 4; table value = 9.49). Students across different mark categories exhibited similar knowledge patterns. Additionally, previous knowledge regarding organophosphorus poisoning ($\chi^2 = 0.27$; df = 2; table value = 5.99) and prior exposure to organophosphorus poisoning clients ($\chi^2 = 0.20$; df = 2; table value = 5.99) were not significantly associated with pre-test knowledge levels. Overall, the findings indicate that none of the selected demographic variables had a statistically significant association with baseline knowledge regarding the management of organophosphorus poisoning.

4. Overall Summary of Results

The findings of the study demonstrate that the structured teaching programme was effective in improving knowledge regarding the management of patients with organophosphorus poisoning among nursing students. The demographic analysis showed that the majority of participants were aged 19–21 years (58%), predominantly female (70%), and had moderate academic performance. Although all students reported having previous knowledge about organophosphorus poisoning and 80% had prior clinical exposure, the pre-test assessment revealed that most participants had inadequate baseline knowledge. Specifically, 38% of students had poor knowledge, 33% had average knowledge, and 29% had good knowledge, with none achieving a very good score.

Following the structured teaching programme, a marked improvement was observed in post-test knowledge levels. No student remained in the poor category, while 43% achieved good knowledge and 30% attained very good knowledge. The mean knowledge score increased from 13.83 (SD = 0.67) in the pre-test to 17.95 (SD = 2.77) in the post-test, with a mean difference of 4.12. The paired t-test revealed a highly significant difference ($t = 13.37$, $p < 0.001$), confirming the effectiveness of the intervention. Furthermore, there was no statistically significant association between pre-test knowledge scores and selected demographic variables such as age, gender, academic performance, prior knowledge, or previous exposure. Overall, the results strongly support that the structured teaching programme significantly enhanced nursing students' knowledge regarding the management of organophosphorus poisoning.

5. Discussion

The present study evaluated the effectiveness of a structured teaching programme (STP) on knowledge regarding the management of organophosphorus (OP) poisoning among undergraduate nursing students. The findings demonstrated a statistically significant improvement in post-test knowledge scores compared to pre-test scores ($p < 0.001$), indicating that the educational intervention was effective. These results reinforce the importance of structured, focused educational strategies in strengthening clinical knowledge among nursing students.

The observed improvement in knowledge following the STP is consistent with recent literature supporting structured educational interventions in nursing education. Chander et al. (2025) reported a significant increase in knowledge scores among B.Sc. Nursing students following a structured health education programme, highlighting the effectiveness of planned instructional strategies in improving cognitive outcomes (10). Similarly, Anshul et al. (2023) demonstrated that a structured teaching programme significantly enhanced knowledge and skills related to basic life support among nursing students (11). Their findings emphasized that systematic and organized teaching enhances understanding, retention, and confidence in clinical practice. Additionally, Patel (2025) found that structured teaching programmes significantly improved knowledge and coping strategies among nursing students, suggesting that educational interventions can positively influence both theoretical and applied competencies (12). These studies collectively support the findings of the present study, confirming that structured educational methods are effective in improving knowledge across various nursing domains.

The significant post-test improvement observed in this study may be attributed to the focused content delivery, interactive discussion, and structured presentation of key concepts such as pathophysiology, emergency management, antidote administration, and nursing responsibilities in OP poisoning. Since OP poisoning is a common medical emergency in India, strengthening knowledge in this area is essential for improving clinical preparedness among future nurses. Despite 100% of participants reporting previous knowledge and 80% reporting prior clinical exposure, pre-test findings revealed inadequate baseline knowledge in a substantial proportion of students. This highlights that prior exposure alone may not ensure adequate conceptual clarity, reinforcing the need for structured academic reinforcement.

However, some recent studies suggest that educational interventions do not always produce consistent or sustained outcomes. De Rezende et al. (2024), in a systematic review on patient safety education interventions, reported mixed results, with some studies demonstrating significant improvements while others showed minimal or no effect on competency outcomes (13). The authors emphasized that variability in intervention design, duration, and assessment tools may influence results. Similarly, Liu et al. (2023) noted that while educational strategies often improve immediate post-intervention knowledge, long-term retention and behavioral application are less consistently demonstrated (14). This suggests that although the STP in the present study was effective in improving short-term knowledge, future research should evaluate long-term retention and translation into clinical practice.

Furthermore, Zoofaghari et al. (2024) highlighted that while knowledge improvement is important in OP poisoning management, clinical competence also depends on practical exposure, simulation-based training, and hands-on skill reinforcement (15). Sole reliance on didactic teaching may not fully prepare students for real-world emergency scenarios. This perspective suggests that while the STP was effective

in improving cognitive knowledge, integration with simulation-based or skill-based training could further enhance competency.

In the present study, no significant association was found between pre-test knowledge and selected demographic variables such as age, gender, academic performance, previous knowledge, or prior exposure. This finding aligns with the study by Chander et al. (2025), which reported uniform effectiveness of structured teaching irrespective of demographic characteristics (1). The lack of demographic influence suggests that structured educational interventions benefit learners broadly, regardless of background characteristics.

6. Conclusion

The present study demonstrated that the structured teaching programme was highly effective in improving knowledge regarding the management of organophosphorus poisoning among undergraduate nursing students. A statistically significant increase in post-test knowledge scores compared to pre-test scores ($p < 0.001$) confirms the positive impact of the educational intervention. The complete elimination of the poor knowledge category and the substantial shift toward good and very good knowledge levels further strengthen the evidence for its effectiveness.

Although all participants reported prior knowledge and most had clinical exposure to organophosphorus poisoning cases, baseline assessment revealed inadequate understanding. This highlights the importance of systematic, structured educational strategies rather than reliance on incidental clinical exposure alone. The findings emphasize that organized teaching programmes play a critical role in strengthening theoretical foundation and improving preparedness for emergency management of poisoning cases.

Overall, the study supports the integration of structured educational modules on toxicological emergencies into undergraduate nursing curricula to enhance competency and clinical readiness.

7. Limitations

Despite significant findings, certain limitations must be acknowledged. The study utilized a one-group pre-test and post-test design without a control group, which limits the ability to attribute improvements exclusively to the intervention. The absence of randomization may introduce selection bias. The sample size was relatively small and drawn from a single institution, which may limit the generalizability of the findings. Additionally, the study assessed immediate post-intervention knowledge gain without long-term follow-up, making it difficult to determine knowledge retention over time.

Furthermore, the study measured knowledge outcomes only and did not assess practical skills or clinical performance related to organophosphorus poisoning management. Future studies incorporating larger samples, control groups, and long-term follow-up assessments are recommended to strengthen the evidence base.

8. Practical Implications

The findings of this study have important implications for nursing education and clinical practice. Given the high incidence and clinical severity of organophosphorus poisoning in India, early recognition and prompt management are crucial. Nursing students, as future frontline healthcare providers, must possess adequate knowledge to manage such emergencies effectively.

Structured teaching programmes can be incorporated into the undergraduate nursing curriculum as part of medical-surgical nursing or emergency care modules. Regular workshops, simulation-based training, and refresher sessions may further enhance knowledge retention and skill development.

At the institutional level, nursing educators can utilize structured educational strategies to address identified knowledge gaps systematically. Integrating toxicology-related emergency management training into academic and clinical orientation programmes can ultimately contribute to improved patient outcomes and reduced morbidity and mortality associated with poisoning cases.

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