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Article

Effectiveness of Educational Session on Acute Poisoning Management of Nurses Working in Tertiary Care Hospitals: A Quasi-Experimental Study

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ABSTRACT

Background: Acute poisoning is a major global health concern, particularly in developing countries, where emergency department nurses often serve as first responders. However, limited data exist regarding their preparedness, especially in the Pakistani context, revealing a significant gap in knowledge and clinical practice related to poisoning management. **Objective**: This study aimed to evaluate the effectiveness of a structured educational session on the knowledge and clinical practices of nurses working in public tertiary care hospitals in Peshawar, focusing on their ability to manage acute poisoning cases. **Methods**: A quasi-experimental pre- and post-intervention design was employed among registered nurses (n = 58) from the emergency departments of three public-sector hospitals. Participants were selected through simple random sampling based on eligibility criteria, excluding those unwilling or absent. Data were collected using a validated self-administered questionnaire assessing knowledge (15 items) and clinical practice (35 items). Following a 1-hour intervention comprising a presentation and practical demonstration, post-test data were collected after one week. Ethical approval was obtained from the Khyber Medical University Ethical Review Board, and all procedures adhered to the Declaration of Helsinki. Statistical analysis was conducted using SPSS v22, with paired t-tests, ANOVA, and correlation applied where appropriate. **Results**: Mean knowledge scores improved significantly from 7.08 ± 0.78 to 14.47 ± 0.75 ($t = 50.83$, $p < 0.001$), and practice scores rose from 12.81 ± 3.19 to 33.63 ± 1.56 ($t = -42.60$, $p < 0.001$). No demographic variable showed a significant association with pre-intervention scores, indicating a uniform benefit of the intervention across all groups. **Conclusion**: The educational session effectively enhanced nurses' knowledge and clinical practices in managing acute poisoning, underscoring the need for routine competency-based training to improve emergency response and patient outcomes in resource-limited healthcare settings.

Keywords: Acute Poisoning, Emergency Nursing, Clinical Competency, Education, Tertiary Care, Pakistan, Knowledge Improvement.

INTRODUCTION

Poisoning remains a critical global health concern, contributing to significant morbidity and mortality worldwide. Each year, an estimated three million cases of poisoning are reported globally, with approximately 250,000 deaths, of which nearly 99% occur in developing countries (1). Acute poisoning, whether intentional or accidental, accounts for a large proportion of emergency department admissions and requires immediate, well-coordinated clinical response. Nurses in Accident and Emergency (A&E) departments are often the first point of contact for poisoned patients, positioning them as key players in the initial assessment, stabilization, and management process (2). Despite this central role, evidence from various studies suggests that nurses frequently possess insufficient knowledge and skills necessary for the effective handling of poisoning cases, particularly in low-resource settings (3).

In developing nations such as Pakistan, the burden of poisoning is compounded by limited surveillance systems, underreporting, and a lack of structured training for healthcare providers. National-level data are sparse, with most studies being localized case series lacking generalizability. For instance, a hospital-based review from Karachi found that 40% of intensive care admissions were due to poisoning, with organophosphates being the leading cause and a recorded mortality rate of 5.6% (4). The

National Health Survey of Pakistan also identified poisoning as the second most common cause of unintentional injuries among individuals aged five years and older (5). These figures highlight not only the prevalence of the issue but also the urgency of targeted educational interventions to prepare frontline healthcare workers, especially nurses, to respond effectively.

Literature from other regions reflects similar deficiencies. Studies conducted in Egypt and Ethiopia have shown that more than 75% of nurses working in emergency departments had poor knowledge related to acute poisoning management (6,7). In Kenya, nurses were found to lack both the theoretical knowledge and practical competencies needed to recognize and treat poisoning cases appropriately (8). These findings suggest a widespread gap in professional preparedness among nursing staff and reinforce the importance of developing, implementing, and evaluating training interventions focused on poisoning management.

Although a few studies have attempted to address this issue through educational programs, there is a notable lack of research in the Pakistani context that evaluates the impact of structured training on nurses' knowledge and clinical practices regarding acute poisoning. The need for such research becomes even more pronounced given the rapidly increasing use of pharmacological and chemical substances, the evolving nature of toxicological emergencies, and the critical time-sensitive role nurses play in managing such cases (9). Furthermore, standard nursing curricula in many institutions do not adequately cover toxicological emergencies, leading to gaps in both academic preparation and practical competency.

This study addresses the identified gap by evaluating the effectiveness of a structured educational session designed to enhance the knowledge and clinical practices of nurses working in the emergency departments of public tertiary care hospitals in Peshawar, Pakistan. It aims to determine whether a short, focused intervention can lead to statistically significant improvements in knowledge and self-reported practices regarding the management of acute poisoning. In doing so, the study also hopes to inform policy and curriculum development for continuous professional development programs in emergency nursing. Therefore, the research question guiding this study is: Does a structured educational session significantly improve the knowledge and clinical practices of nurses regarding acute poisoning management in tertiary care hospitals of Peshawar?

MATERIALS AND METHODS

This quasi-experimental pre- and post-intervention study was conducted to evaluate the effectiveness of a structured educational session on the knowledge and clinical practices of nurses regarding acute poisoning management. The study was carried out in the Accident and Emergency (A&E) departments of three public sector tertiary care hospitals in Peshawar, Pakistan: Lady Reading Hospital (LRH), Khyber Teaching Hospital (KTH), and Hayatabad Medical Complex (HMC). Nurses were eligible to participate if they were registered and actively working in the A&E departments during any shift (morning, evening, or night) at the time of the study. Nurses on leave or those unwilling to provide consent were excluded. A sampling frame of 196 registered nurses (130 from LRH, 36 from KTH, and 30 from HMC) was constructed. Using G*Power software and a paired-samples t-test with a confidence level of 95% and $\alpha = 0.05$, a sample size of 54 was estimated. To account for a 10% non-response rate, the final sample included 58 nurses. Participants were selected through simple random sampling proportionally from each hospital—38 from LRH, 11 from KTH, and 9 from HMC. Informed verbal and written consent was obtained from all participants after explaining the study's purpose, procedures, and voluntary nature of participation.

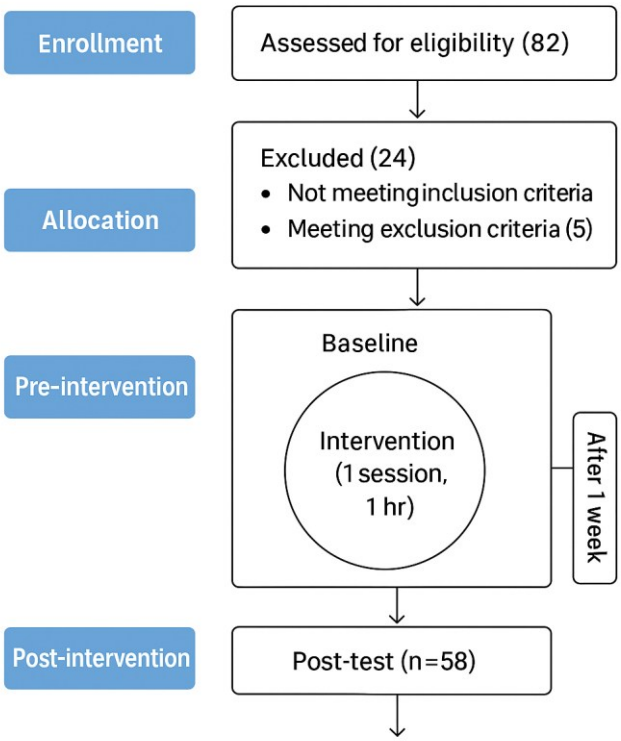

Figure 1 Study Flowchart

The primary outcomes of the study were the nurses' knowledge and self-reported practices regarding acute poisoning management. A validated, self-administered questionnaire previously used in similar studies (Cronbach's alpha = 0.75) was employed to measure these outcomes (2). The questionnaire consisted of three sections: demographic data, knowledge assessment (15 items), and practice assessment (35 checklist items covering ABC management, history taking, medical assessment, and gastrointestinal decontamination). Correct responses were scored as 1, and incorrect as 0, generating cumulative scores for each participant. Data were collected in three phases: pre-intervention assessment, intervention, and post-intervention assessment. During the pre-intervention phase, participants were divided into two groups based on hospital location to facilitate scheduling. Pre-intervention data were collected using the questionnaire under researcher supervision. Immediately following, a one-hour educational session was conducted, which included a 45-minute lecture using a PowerPoint presentation and a 15-minute practical demonstration on gut decontamination. The session focused on

early recognition of poisoning signs, appropriate interventions, and emergency protocols. Participants were encouraged to ask questions and share the information with their peers. One week later, post-intervention data were collected using the same instrument to measure change in knowledge and practice.

The study adhered to the principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Ethical Review Board of Khyber Medical University, Peshawar. Institutional permission for conducting the study was granted by the respective hospital administrations through the Director of the Institute of Nursing Sciences. All participants provided informed consent, and confidentiality was maintained by anonymizing questionnaire responses and securely storing data accessible only to the research team.

Data analysis was conducted using SPSS version 22. Descriptive statistics including frequencies, percentages, means, and standard deviations were used to summarize demographic characteristics and outcome variables. Paired-sample t-tests were applied to compare pre- and post-intervention scores for knowledge and practice. Independent t-tests were used to evaluate mean differences based on binary demographic variables such as gender and prior training. One-way ANOVA was employed for comparisons among categorical variables with more than two groups, such as qualification and workplace. Pearson correlation was used to examine relationships between continuous demographic variables like years of A&E experience and outcome scores. A p-value of less than 0.05 was considered statistically significant throughout the analysis (2). No missing data were encountered, and all participants completed both phases of the study.

RESULTS

A total of 82 nurses were assessed for eligibility. Of these, 24 were excluded (19 did not meet inclusion criteria; 5 met exclusion criteria), and the remaining 58 participants were enrolled and completed both the pre- and post-intervention assessments. The majority of participants were female (83%), and most were working at Lady Reading Hospital (66%). In terms of qualifications, 41.4% held a Post-RN diploma, and 86% of participants reported no prior training in poisoning management. The complete demographic distribution is presented in Table 1.

Table 1. Demographic characteristics of study participants (N = 58)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	10	17.2%
	Female	48	82.8%
Educational Qualification	3-Year Diploma	21	36.2%
	Post-RN	24	41.4%
	4-Year BSN	13	22.4%
Hospital Affiliation	Lady Reading (LRH)	38	65.5%
	Khyber Teaching (KTH)	11	19.0%
	Hayatabad Medical (HMC)	9	15.5%
Prior Training in Poisoning Management	Yes	8	13.8%
	No	50	86.2%

Participants' knowledge was assessed using a 15-item questionnaire, scored as 1 for correct and 0 for incorrect answers. Pre-intervention, the mean knowledge score was 7.08 ± 0.78, which significantly increased to 14.47 ± 0.75 after the educational session. A paired-sample t-test indicated a statistically significant improvement ($t = 50.83$, $p < 0.001$), suggesting a large effect size and robust educational impact (see Table 2).

Table 2. Comparison of knowledge and practice scores before and after intervention (N = 58)

Variable	Pre-test Mean ± SD	Post-test Mean ± SD	t-value	p-value
Knowledge Score	7.08 ± 0.78	14.47 ± 0.75	50.83	< 0.001
Practice Score	12.81 ± 3.19	33.63 ± 1.56	-42.60	< 0.001

Furthermore, knowledge scores were categorized into three levels: Poor (≤50%), Good (51–75%), and Excellent (>75%). Before the intervention, 72.4% of participants had poor knowledge and 27.6% had good knowledge; none achieved excellent scores. After the session, 100% reached the excellent category, underscoring the intervention's effectiveness (see Figure 2, not shown here). Practice was assessed using a 35-item observational checklist. The mean pre-test score was 12.81 ± 3.19, which improved significantly to 33.63 ± 1.56 post-intervention ($t = -42.60$, $p < 0.001$), reflecting not only statistical but also clinically meaningful improvement in adherence to practice standards.

Practice performance was likewise categorized. Pre-intervention, 94.8% of participants demonstrated poor practices and 5.2% showed good practices, with none reaching the excellent threshold. Post-intervention, 94% achieved excellent practice scores, while 6% were classified as good. No participants remained in the poor category post-training. Statistical tests were used to explore whether demographic variables influenced baseline (pre-test) knowledge and practice scores.

No statistically significant associations were observed for gender, qualification, hospital affiliation, years of A&E

experience, or prior poisoning training (see Table 3 and Table 4). The absence of significant demographic influence implies that the observed improvements were consistent across diverse nurse profiles.

Table 3. Association between demographic variables and pre-intervention knowledge scores

Demographic Variable	Test Type	Statistic (t/F/r)	p-value
Gender	Independent t-test	t = 1.41	0.16
Qualification	ANOVA	F = 0.36	0.69
Hospital	ANOVA	F = 1.50	0.23
A&E Experience (years)	Pearson Correlation	r = 0.12	0.38
Prior Training	Independent t-test	t = -1.14	0.26

Table 4. Association between demographic variables and pre-intervention practice scores

Demographic Variable	Test Type	Statistic (t/F/r)	p-value
Gender	Independent t-test	t = 0.97	0.34
Qualification	ANOVA	F = 1.02	0.37
Hospital	ANOVA	F = 0.51	0.60
A&E Experience (years)	Pearson Correlation	r = -0.06	0.65
Prior Training	Independent t-test	t = -1.64	0.10

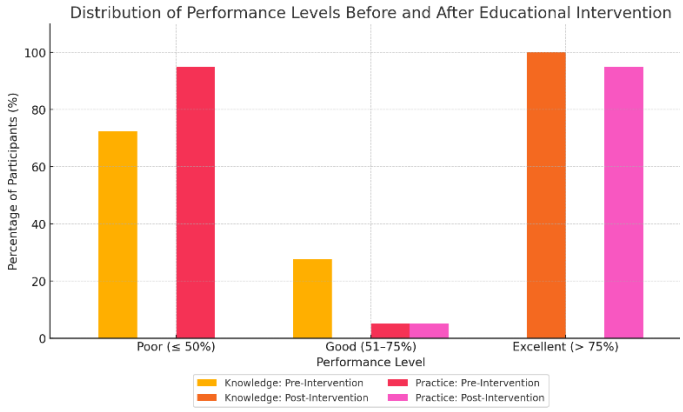

Figure 2 Distribution of Performance Levels

DISCUSSION

The findings of this quasi-experimental study demonstrate that a structured educational intervention significantly improves nurses' knowledge and clinical practice regarding acute poisoning management. This is of considerable clinical relevance given that emergency department nurses are often the first healthcare providers to assess and stabilize poisoned patients. The marked improvement from pre- to post-test in both knowledge (from 7.08 ± 0.78 to 14.47 ± 0.75) and practice scores (from 12.81 ± 3.19 to 33.63 ± 1.56) not only confirms the effectiveness of the educational session but also highlights the critical need for regular training in high-risk, time-sensitive clinical scenarios such as poisoning emergencies.

These results are consistent with earlier studies that have similarly reported low baseline knowledge levels among nurses working in emergency settings. A study conducted in Egypt found that all nurses assessed had unsatisfactory knowledge (<75%) regarding poisoning management, with significant post-intervention gains after a structured educational program (6). Likewise, a study in Ethiopia revealed suboptimal nurse preparedness, with knowledge and practice scores improving substantially following a brief training intervention (2). The current findings also resonate with evidence from Kenya and India, where a significant proportion of nurses exhibited inadequate pre-training knowledge and practice, and educational interventions led to demonstrable improvements (11, 21). The present study adds to this body of work by being among the first in Pakistan to quantify the effects of such an intervention within the context of tertiary care public hospitals.

Interestingly, the study found no statistically significant relationship between baseline knowledge or practice scores and demographic variables such as gender, educational qualification, years of emergency department experience, or prior training. This aligns with prior literature indicating that institutional training gaps often override individual experience or educational background in predicting competence in poisoning scenarios (11). These findings suggest that deficiencies in initial nursing education or lack of continuing professional development opportunities may be uniformly affecting the emergency nursing workforce. The absence of prior training in 86% of the participants underscores the systemic gap in professional preparedness and the necessity of institutionalizing periodic refresher courses.

From a theoretical perspective, the results support the constructivist learning paradigm, which posits that learners build knowledge through active engagement and contextual experiences. The significant knowledge gain observed in the current study may be attributed not only to the didactic component but also to the practical demonstration included in the training session. This aligns with adult learning theories that emphasize experiential learning and problem-solving as core mechanisms for knowledge retention and behavioral change. Furthermore, the rapid improvement within one week suggests that short, targeted educational interventions can produce immediate and clinically meaningful outcomes, especially when integrated with interactive and hands-on learning components.

Clinically, improved nurse competency in poisoning management has the potential to enhance triage accuracy, reduce treatment delays, and ultimately improve patient outcomes. Early and effective interventions by nurses can

significantly impact morbidity and mortality, particularly in resource-constrained settings where timely access to physicians or toxicologists may be limited. In this light, the study's findings not only highlight the efficacy of the intervention but also underscore its scalability and utility in broader national or regional training initiatives.

Despite its strengths, including a robust methodological design, the use of a validated assessment tool, and complete follow-up with no attrition, the study is not without limitations. The absence of a control group limits the ability to rule out alternative explanations for the observed improvements, such as the Hawthorne effect or self-learning following pre-test exposure. The relatively small sample size and single-city focus also limit the generalizability of the findings. Furthermore, the one-week follow-up interval, while sufficient for assessing short-term knowledge gain, does not provide insights into long-term retention or sustained practice change. Future research should incorporate larger, multi-center designs with longer follow-up periods and control groups to validate and expand upon these findings.

Additionally, future studies could explore the impact of integrating toxicology modules into nursing curricula and assess whether spaced learning or simulation-based training further enhances competence. Investigating inter-professional training approaches, where nurses are trained alongside physicians and pharmacists, may also reveal synergistic benefits in emergency response preparedness. Moreover, longitudinal assessments of patient outcomes linked to nurse training levels would be invaluable in quantifying the real-world impact of such interventions.

In summary, this study reinforces the critical role of continuous education in strengthening emergency nursing capabilities, particularly in high-acuity areas like poisoning management. The substantial improvements observed post-intervention highlight the intervention's effectiveness and provide a compelling case for institutionalizing similar training programs. Bridging the gap between knowledge and practice through structured educational strategies has the potential to significantly advance clinical safety, workforce preparedness, and patient care outcomes in emergency healthcare settings.

CONCLUSION

This study concluded that a structured educational session significantly improved the knowledge and clinical practices of nurses working in tertiary care hospitals regarding the management of acute poisoning, addressing a critical gap in emergency preparedness. The intervention led to statistically and clinically meaningful enhancements in both domains, with all participants achieving excellent knowledge levels and the majority demonstrating excellent post-intervention practices. These findings underscore the need to integrate targeted training into routine professional development programs to equip nurses with the competencies necessary for timely and effective poisoning management. Clinically, such interventions can enhance patient outcomes and reduce poisoning-related morbidity and mortality, particularly in resource-limited settings. From a research perspective, the results support further exploration into scalable, context-specific educational models that promote long-term retention and interdisciplinary readiness in acute care environments.

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