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Effectiveness of Awareness and Understanding of Patient Safety Training for Nursing Students: A Quasi-Experimental Study

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ABSTRACT

Introduction: Patient safety, according to the World Health Organization (WHO), is the avoidance of mistakes and negative consequences related to medical treatment. Concern among the general public and professionals has grown as a result of increased awareness of medical errors and their repercussions, especially as they have been brought to light by the media and social media. The Institute of Medicine (IOM) has placed a strong emphasis on patient safety, pointing out that adverse events play a major role in inpatient mortality. **Objectives**: 1. To assess nursing students' knowledge regarding patient safety, 2. To evaluate the effectiveness of a patient safety awareness program and to assess its impact on nursing students' knowledge. 3. To determine the association between knowledge scores and selected demographic variables. **Methods**: Purposive sampling was used to choose 100 third-year General Nursing and Midwifery (GNM) nursing students for a quasi-experimental study with a pre-test post-test design. A structured knowledge questionnaire on patient safety was used to gather data. The pre-test was followed by an awareness program, and two days later, there was a post-test. Descriptive and inferential statistics (paired *t*-test, ANOVA, and independent *t*-test) were used to examine the data; $p < 0.05$ was deemed statistically significant. **Results**: The 100 nursing students were all female, and most were between the ages of 21 and 25. The majority of pre-test knowledge (49%) was ordinary, but post-test results showed a significant improvement, with 58% attaining excellent and 6% exceptional knowledge. The average score rose from 8.58 ± 2.79 to 30.26 ± 5.91 ($p = 0.0001$). Urban students scored much higher than rural pupils ($p < 0.05$), although there was no significant correlation between knowledge and age. **Conclusion**: The findings of this study demonstrate that a structured patient safety awareness program significantly improved the knowledge of patient safety among GNM nursing students. The results highlight the value of integrating patient safety education into the nursing curriculum to strengthen students' understanding of safe clinical practices and support the delivery of high-quality patient care. Although age was not associated with knowledge improvement, differences based on area of residence suggest that educational resources and learning opportunities may influence outcomes. Future research should include larger, more diverse samples, evaluate long-term knowledge retention, and compare the effectiveness of different educational approaches, such as simulation-based, case-based, and technology-assisted learning.

Keywords: Health Education; Knowledge; Nursing; Patient Safety; Prevention and Control; Students

INTRODUCTION

According to the WHO, patient safety involves preventing healthcare-related errors and reducing avoidable harm to patients. Adverse events affect approximately 10% of hospitalized patients worldwide, and nearly half of these events are considered preventable (Kim *et al.,* 2025). In low- and middle-income countries, unsafe care is estimated to cause 134 million adverse events and 2.6 million deaths annually. The magnitude of this problem was highlighted in the Institute of Medicine's seminal report, *To Err Is Human*, which estimated

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that as many as 98,000 preventable deaths occur annually in the United States (Park & Yeom, 2025).

In recent decades, awareness of patient safety and medical errors has increased considerably among healthcare professionals, policymakers, and the public. Consequently, healthcare systems worldwide have implemented various initiatives, including patient safety policies, standardized safety protocols, and educational programmes, to reduce preventable adverse events and improve the quality of care (Komeili *et al.,* 2023; Baek & Shin, 2025). Despite these efforts, challenges such as underreporting of errors, limited safety training, and organizational barriers continue to hinder the effective implementation of patient safety practices. These challenges highlight the need to strengthen patient safety education among nursing students to prepare them for safe clinical practice.

The cornerstones of patient harm reduction methods are education and training. Despite nursing students' crucial front-line involvement in clinical practice, patient safety education has historically targeted doctors and practicing nurses (Voss & Yasobant, 2024). Prior studies have demonstrated that organized instruction can enhance medical and nursing students' understanding of safety. Nevertheless, the majority of research was restricted to small samples, single institutions, or descriptive methods, and it hardly ever examined the impact of demographics on knowledge (Sadeghi *et al.,* 2025). Mohammed *et al.* (2023) identified a continuing lack of evidence regarding nursing students' baseline knowledge of patient safety and the effectiveness of structured awareness programs, particularly in the Indian context. Addressing this gap is essential for integrating patient safety education into nursing curricula and promoting improved healthcare practices (Shin *et al.,* 2021).

The goals of the current study were to: (1) Measure the level of patient safety knowledge among nursing students; (2) Analyze the efficacy of a structured patient safety awareness program; and (3) Ascertain the relationship between knowledge scores and particular demographic characteristics. This study employs a quasi-experimental pre-post design with a bigger sample of nursing students, in contrast to other research that mostly concentrated on healthcare professionals or small student groups. It offers fresh perspectives for incorporating structured safety education into nursing curriculum by highlighting the efficacy of awareness training and examining demographic variables like age and place of residence (Jacob & Thomas, 2018).

While the effectiveness of patient safety education among nursing students has been the subject of numerous studies, the current study makes significant methodological and contextual advances. Innovative teaching strategies like flipped classrooms or attitude evaluation in formal academic settings were the main focus of earlier research, such as that conducted by Kim *et al*. (2019). In a similar Li *et al*. (2023) highlighted online and simulation-based learning approaches in highly developed technology environments, emphasizing their potential to enhance patient safety education and improve nursing students' practical skills and knowledge retention.

Although previous studies have demonstrated that patient safety education improves nursing students' knowledge, evidence from Indian General Nursing and Midwifery (GNM) students remains limited. The present study evaluated the effectiveness of a structured, low-cost patient safety awareness programme among Indian GNM nursing students in a resource-limited educational setting (Cantero-López *et al.,* 2021). In addition to assessing changes in knowledge following the intervention, the study examined the association between selected demographic characteristics, including age and area of residence, and knowledge outcomes. The findings provide context-specific evidence that may support the integration of structured patient safety education into GNM nursing curricula and inform educational practices in similar resource-constrained settings (European Commission, 2014).

METHODOLOGY

The current study's methodology was informed by well-established research frameworks for quasi-experimental designs that are frequently employed in nursing and educational research. It is commonly acknowledged that a one-group pre-test post-test design is a useful technique for assessing how educational interventions affect knowledge results (Polit & Beck, 2008). In academic settings where randomization might not be feasible, this method ensures practical viability by allowing baseline and post-intervention results to be compared within the same group.

Design of the Study

To assess the efficacy of a patient safety awareness program among GNM nursing students, this study used a one-group pre-test post-test quasi-experimental approach.

Setting for Study

Selected nursing colleges participated in the study. Participants were GNM students who were enrolled in these schools.

Sample and Sampling

GNM nursing students between the ages of 18 and 35 made up the target population. The necessary sample size was determined to be 93.13, rounded to 100 participants, using Cochran's calculation.

Sample Calculation

Cochran formula for sample size estimation:

$N = Z^2 p(1-p)/d^2$

If population exceeds 10,000, where

a confidence level's Z statistic. (The *z*-value equals 1.96 at the standard 95% level of confidence.)

P: proportion or predicted prevalence (For *P*, 0.5 is utilized).

d: precision (it is believed that a d of 0.05 will produce high accuracy and a lower estimate error).

Z = 1.96

P = Proportion of nurses who had good knowledge, positive attitudes, and good practices towards patient safety = 58.7% = 0.587

d = Desired margin error = 10% = 0.10

$$n = \frac{1.96^2 * 0.587 * (1-0.587)}{0.10 * 0.10}$$

$$= 93.13$$

=100 participants required in the study

Inclusion and Exclusion Criteria

The study included GNM students aged between 18 and 35 years who were willing to participate and were available during the period of data collection. Students who provided informed consent and were present at the time of the study were considered eligible. However, students who were absent during data collection or those who declined to participate were excluded from the study. Additionally, participants who withdrew consent or did not complete the intervention were not included in the final analysis.

Non-probability purposive sampling was used to select participants who met the inclusion criteria. Attrition was monitored during the study period to ensure complete data collection.

Intervention

The patient safety awareness program was delivered to the single group of participants.

Pre-test: On the first day, participants completed a structured questionnaire assessing baseline knowledge of patient safety.

Awareness Program: Following the pre-test, participants attended the awareness program, which included lectures, discussions, and practical examples of safe nursing practices.

Post-test: On the second day, participants completed the same questionnaire to evaluate the effectiveness of the intervention.

Instrument

Data was collected using a structured questionnaire on patient safety awareness.

Name of Instrument: Questionnaire

Developer: The tool was developed by researchers based on an extensive review of literature.

Description: The questionnaire included items covering knowledge, attitudes, and practices related to patient safety.

Validity and Reliability

Expert review was used to determine content validity. Cronbach's alpha was used to evaluate reliability; the result was [0.8843], which indicates acceptable internal consistency. The variables of interest were successfully measured by the equipment.

Data Collection Process

The period of data collection was April 1–April 7, 2024. The goal of the study was presented to each participant personally. Written informed consent was acquired. Instructions for completing the survey on one's own were given, and it was administered in a peaceful environment. It took each participant about half an hour to finish the questionnaire. Completed surveys were promptly gathered and safely kept for examination.

Data Analysis

The collected data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize participants' demographic characteristics and knowledge scores. The effectiveness of the patient safety awareness programme was assessed using the paired t-test by comparing pre-test and post-test knowledge scores. One-way analysis of variance (ANOVA) was used to examine differences in post-test knowledge scores across age groups, while the independent t-test was used to compare knowledge scores according to the area of residence. A *p*-value of less than 0.05 was considered statistically significant.

Descriptive Statistics

Frequencies, percentages, means, and standard deviations were used to summarize participant demographics and patient safety knowledge scores.

This included a summary of the participants' initial knowledge levels and baseline profiles.

Inferential Statistics

The mean knowledge scores from the pre-test and post-test within the same group are compared using the paired *t*-test to assess whether participants' knowledge significantly increased due to the awareness program. This exam assesses if participants' knowledge was considerably increased by the awareness program.

Effect Size (Cohen's)

Determined how much the knowledge scores changed following the intervention.

Normality Check

The Shapiro-Wilk test was used to verify the assumption of normality for paired differences.

Non-parametric Alternative: The Wilcoxon signed-rank test was used as a non-parametric alternative to compare test results before and after if normality assumptions were broken.

For all inferential tests, a *p*-value of less than 0.05 was deemed statistically significant, signifying a significant shift in participants' knowledge as a result of the intervention.

Ethical Consideration

The research proposal was approved by the Institutional Ethics Committee of Smt. Radhikabai Meghe Memorial College of Nursing, Sawangi (Meghe), Mumbai, with approval number ECR/440/Inst/MH/2013/RR-2019, reference number DMIHER(DU)/IEC/2024/211, on 30th January 2024.

Every participant provided written informed permission. Students were free to stop participating at any time without incurring any fees. Participants received explanations of the study's methods and goals in a language they could comprehend, and all questions were answered. Data was safely stored under lock and key to ensure confidentiality.

RESULTS

In Table 1, the findings on the demographic characteristics of the study participants are presented. Out of 100 GNM students, the majority (61%) were between 21–25 years of age, 30% belonged to the 15–20 years age group, and only 9% were above 25 years. All participants were female, with no male representation. Regarding residence, 41% of students lived in rural areas, while 59% resided in urban areas. Every participant was professionally enrolled in the GNM program, and all were in the third year of the course, ensuring uniformity in training experience and academic standing. These findings provide a comprehensive understanding of the study population, which is essential for accurate evaluation of the research results.

Table 1: Demographic Distribution of Nursing Students (n =100)

Demographic Variables	Number of Students	Percentage (%)
Age(yrs)		
15-20 yrs	30	30
21-25 yrs	61	61
>25 yrs	9	9
Area of residence		
Rural	41	41
Urban	59	59

In Table 2, the findings related to nursing students' knowledge about patient safety are presented. The results indicate that students' knowledge significantly improved after the intervention. In the pre-test, the majority of students (49%) demonstrated only average knowledge (score range 5–8), while 36% showed satisfactory knowledge (9–12), 12% achieved very good knowledge (13–16), and only 1% reached the excellent category (17–20). Additionally, 2% of students reported low knowledge (0–4). In contrast, the post-test results revealed a remarkable improvement, as no student remained in the low or average category. Instead, 37% demonstrated adequate knowledge, 58% attained a very satisfactory level, and 6% achieved excellent knowledge. The minimum score increased from 4 in the pre-test to 11 in the post-test, while the maximum score from 19 in the pre test to 20 in post test. The mean knowledge score also showed a significant rise from 8.58 ± 2.79 to 15.13 ± 2.96, and the mean percentage knowledge score improved from 42.90% ± 13.96 to 75.65% ± 14.79. These findings clearly demonstrate the effectiveness of the awareness program in enhancing the knowledge of nursing students regarding patient safety.

Table 2: Evaluation Based on Degree of Expertise in Patient Safety (n=100)

Level of knowledge score	Score Range	Level of Knowledge Regarding Patient Safety	
		Pretest	Post-test
Low	0-4	2(2%)	0 (0%)
Average	5-8	49(49%)	0 (0%)
Good	9-12	36 (36%)	37 (37%)
Very good	13-16	12(12%)	58(58%)
Excellent	17-20	1 (1%)	6(6%)
Mean score		8.58 ±2.79	15.13 ± 2.96
Mean % knowledge Score		42.90 ±13.96	75.65 ± 14.79

In Table 3, the statistical analysis of pre-test and post-test knowledge scores highlights the significant improvement in students' understanding of patient safety after the intervention. The mean score increased from 8.58 ± 2.79 in the pre-test to 30.26 ± 5.91 in the post-test, reflecting a substantial mean difference of 21.68 ± 2.18. This improvement was further validated through a paired *t*-test, which yielded a *t*-value of 43.74 with a *p*-value of 0.0001. As the *p*-value was less than 0.05, the results were statistically significant, confirming that the awareness training had a positive and meaningful impact on students' knowledge. The high *t*-value additionally supports the strength of this improvement, emphasizing the effectiveness of the intervention in enhancing nursing students' understanding of patient safety.

Table 3: Significance of the Variation in the Nursing Student's Pre- and Post-Test Knowledge Scores (n=100)

Test	Mean	SD	Mean Difference	*t*-value	*p*-value
Pre Test	8.58	2.79	21.68±2.18	43.74	0.0001 S, $p<0.05$
Post Test	30.26	5.91			

In Table 4, the comparison of post-test knowledge scores across different age groups of nursing students is presented. Students aged 15–20 years obtained a mean score of 29.56 ± 9.18; those aged 21–25 years achieved a mean score of 30.81 ± 3.56, while students above 25 years recorded a mean score of 28.77 ± 5.04. The one-way ANOVA analysis produced an *F*-value of 0.75 with a *p*-value of 0.47, which is greater than 0.05. These findings indicate that the variation in knowledge scores among the three age groups was not statistically significant (NS, $p > 0.05$). Thus, age had no significant impact on the effectiveness of the patient safety awareness program.

Table 4: Relationship between Nursing Students' Age in Years and their Post-Test Patient Safety Knowledge Score (n=100)

Age (yrs)	Number of Nursing Students	Mean Difference	*F*-value	*p*-value
15-20 yrs	30	29.56±9.18	0.75	0.47 NS, $p>0.05$
21-25 yrs	61	30.81±3.56		
>25 yrs	9	28.77±5.04		

In table 5, the post-test knowledge scores based on the area of residence revealed a statistically significant difference between rural and urban nursing students. Students from rural areas (n = 41) had a mean score of 28.87 ± 7.02, whereas those from urban areas (n = 59) had a higher mean score of 31.22 ± 4.83. The *t*-value was 2.01 with a *p*-value of 0.047, which is less than 0.05. This indicates a statistically significant difference (S, $p < 0.05$) in knowledge scores based on area of residence, suggesting that urban students performed significantly better in the post-test compared to their rural counterparts.

Table 5: Nursing Students' Post-Test Patient Safety Knowledge Scores are Correlated with their Residential Area (n=100)

Area of Residence	Number of Nursing Students	Mean Difference	*t*-value	*p*-value
Rural	41	28.87±7.02	2.01	0.047 S, $p<0.05$
Urban	59	31.22±4.83		

DISCUSSION

One hundred GNM nursing students participated in this quasi-experimental study to evaluate the effectiveness of a structured patient safety awareness programme. The findings demonstrated a significant improvement in nursing students' knowledge following the intervention, indicating that structured educational programmes can effectively strengthen patient safety awareness. These findings are consistent with previous studies reporting that patient safety education enhances nursing students' knowledge and preparedness for safe clinical practice (Kim *et al.,* 2019; Cantero-López *et al.,* 2021).

The improvement in knowledge observed in the present study may be attributed to the structured and interactive nature of the awareness programme, which combined theoretical concepts with practical examples relevant to nursing practice. Similar findings have been reported in previous studies, where educational interventions, including simulation-based and interactive learning approaches, improved patient safety

competencies and promoted safer clinical decision-making (Levett-Jones *et al.,* 2020; Gordon *et al.,* 2012). Although the present study used a low-cost awareness programme rather than advanced simulation technologies, the intervention was effective in improving students' understanding of patient safety in a resource-limited educational setting.

The analysis of demographic variables showed that age was not significantly associated with post-test knowledge scores, suggesting that students across different age groups benefited similarly from the intervention. In contrast, students from urban areas achieved significantly higher post-test knowledge scores than those from rural areas. This difference may reflect variations in previous educational exposure, access to learning resources, or opportunities for academic support, as reported in earlier studies (Li *et al.,* 2023; Svitlica *et al.,* 2021).

The pre-test findings indicated that many students had only average knowledge of patient safety before the intervention, highlighting the need for structured patient safety education during nursing training. Following the awareness programme, most participants achieved good to excellent knowledge levels, demonstrating the effectiveness of the intervention in addressing existing knowledge gaps. These findings support the integration of structured patient safety education into nursing curricula to promote a culture of safety and prepare future nurses to provide high-quality and safe patient care.

Limitations

It is crucial to consider the limitations of the current study when assessing the outcomes. The study's small sample size of 100 GNM nursing students from certain colleges would limit how widely the results can be used. Additionally, the results may have been influenced by other factors, making it difficult to attribute changes solely to the intervention when utilizing a one-group pre-test post-test design without a control group. Since the knowledge assessment was carried out very shortly after the intervention, it was not possible to ascertain the long-term retention of patient safety information. Additionally, a self-reported questionnaire that may be prone to response bias and social desirability bias was used to gather the data. The results could have been impacted by additional influencing factors that were not examined in this study, such as individual academic achievement, differences in teaching approaches, and prior exposure to patient safety ideas.

Future Scope

Future research should incorporate larger and more varied samples from several institutions to overcome the limitations of this study. To assess patient safety knowledge retention and practical application in clinical settings, longitudinal studies are advised. The best methods for patient safety education may be found by comparing several teaching approaches, such as simulation-based learning, case-based discussions, or e-learning modules, and incorporating control groups. Sustainable advances in healthcare safety practices could be strengthened by incorporating organized patient safety modules into core nursing courses and evaluating their effects on clinical competence and patient outcomes.

CONCLUSION

The current study shows that GNM nursing students' knowledge of patient safety awareness has greatly increased due to the training. The patient safety awareness training greatly increased the knowledge of GNM nursing students, as demonstrated by the current study. greatly increased by the patient safety awareness training. Structured educational interventions can significantly improve students' comprehension of patient safety, as evidenced by a considerable rise in post-test scores relative to pre-test scores. While students from urban regions scored somewhat higher than those from rural areas, age did not significantly change outcomes, indicating that access to resources may have an impact on learning outcomes.

These results highlight how crucial it is to incorporate frequent patient safety training into nursing programs to improve understanding and encourage safer clinical procedures. Nursing programs can help improve healthcare outcomes by teaching student's critical patient safety practices early in their studies.

CRediT Authorship Contribution Statement

V.D: Conceptualization, Methodology, Data curation, Writing Original draft preparation, Formal analysis,

Investigation, Resources. V.T: Supervision, Validation, Writing Review and Editing, T.B: Writing Review and Editing, Visualization, Data interpretation.

AI Assistance Declaration

ChatGPT and other generative AI technologies were only utilized for grammar correction and language improvement when this paper was being prepared. The content produced with the use of these tools was thoroughly examined and revised by the authors, who are solely responsible for the final text. Data analysis, interpretation, and the creation of scientific content were all done without the aid of AI.

Conflict of Interest

The authors declare that they have no competing interests.

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