

Impact of Online Nursing Education on Nursing Students' Knowledge, and Attitude Towards Patient Safety in India: An Interventional Study

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ABSTRACT

Introduction: Protection of patients from harm and error is a global priority. Delivering safe patient care is an essential component of nursing education. Patient safety education encompasses a successful integration of patient care with adequate knowledge and attitude among nursing students.

Objectives: The purpose of this study is to evaluate and establish the effectiveness of patient safety education among nursing students who have received online education. **Methods:** A descriptive study following one group pre-test and post-test research design was adopted. The nursing students, attending online nursing education, participated in two phases: phase I, 383, and phase II, 38 (1/10th of 383). Data was collected through an online Google form on patient safety. **Results:** The first phase data showed that, out of 383 students, 223 (58.22%) were participants aged between 18 and 21 years, 151 (39.43%) were from 3rd year Bachelor of Science (B. Sc.) nursing, and 250 (65.27%) had attended more than 6 months of online classes, with 294 (76.76%) reporting a lack of practical confidence. Data also identified that nursing students had only 59.53% and 42.82% good knowledge and attitude scores toward patient safety. As a result, an educational workshop on patient safety was organised in the 2nd phase, and the workshop established an effectiveness by enhancement of knowledge and attitude scores. Before intervention, the pre-test knowledge scores were very good, 3 (7.89%), but after intervention, it improved to 17 (44.74%), and in the same, before intervention the pre-test attitude scores very good were 10 (26.32%), which was improved to 19 (50.00%) after intervention with a significant *t*-value of 9.23 for knowledge and 3.66 for attitude at a 95% confidence interval. **Conclusion:** Ensuring patient safety is a fundamental aspect of healthcare practice. Equipping nursing students with sufficient knowledge and fostering positive attitudes toward patient safety is essential. Prolonged reliance on online education has adversely affected nursing students' practical confidence in this area. Consequently, implementing interventional workshops on patient safety has proven to be an effective strategy for improving nursing students' knowledge and attitudes.

Keywords: Attitude; Knowledge; Online Nursing Education; Patient Safety

INTRODUCTION

Patient safety is a top priority and fundamental principle of health care settings. Every year the rising number of unsafe practices makes patient safety challenging (Wake *et al.*, 2021). The World Health Organization (WHO) takes initiatives on the global patient safety plan 2021–2030 to identify and prevent patient care-associated harm and errors in practices (Amaral, 2023). Nurses should possess fundamental knowledge and attitudes to effectively manage patient safety. They are providing care as direct frontline caregivers. Raising awareness through education can improve patient safety and reduce harmful practices. According to Ayyad *et al.* (2024), unsafe practices rank as the 10th leading cause of death and disability in the global patient safety domain.

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Nursing education represents the foundation of safe patient care. It aims to establish a positive knowledge and attitude toward patient safety (Svitlica *et al.*, 2021). One quasi-experimental research study reported significant gaps in pre-intervention knowledge and attitude between learning and real practice among nursing students. Another cross-sectional study reported that medical and nursing had gaps in knowledge and attitude toward patient safety. An intervention can enhance the positive outcomes in knowledge and attitudes among nursing students (Lee & Dahinten, 2023). Other research studies revealed that more exposure helps develop confidence. Final-year students are much more confident than first-year students (Tanim, 2022).

The prolonged online nursing education during the pandemic has distorted real learning. The shift from face-to-face teaching and learning to online nursing mode left nursing students lacking confidence. One research study was conducted to assess clinical confidence following online education. The data reported that students lacked clinical confidence (Ulenaers *et al.*, 2021).

Most students encounter difficulties maintaining the continuity of their online education. Few students reported having supportive internet connectivity for their online education (Addae *et al.*, 2022). Moreno-Sánchez (2022) conducted a research study among 400 nursing students to assess their opinions towards online nursing education. The data revealed that 83.33% of students gained clinical experiences through online nursing education, while 80.50% expressed dissatisfaction with online education. Li *et al.* (2021) conducted another study in China among 230 international students to assess feedback on online education, revealing that only 36.5% of nursing students expressed satisfaction with online education. An Indian descriptive study involved 835 under- and post-graduate nursing students. The majority (61.3%) of students reported that 42.4% and 38.9% of them used mobile data and internet data for online education, while 97% of them used smartphones as an educational tool. Additionally, the majority of students (24.4%) were in their third year of professional nursing Dhawan *et al.*, 2022

Patient safety is a framework of safe patient care activities (WHO, 2021). Maintaining patient safety is a priority in health measurement policy (Ayu, Rumerung & Tahulending, 2024). Presently nurses are working in a pivotal role in managing patient safety, whether they are administrators or novices (Zhao *et al.*, 2023). The pandemic shifted students' clinical learning experiences to technology-based, simulation, or scenario-based learning (Samarasekara, 2022).

A good clinical environment is crucial for the ideal professional development of nursing students (Arundell, Peters & Sheehan, 2022). One survey was done among 307 nursing students to assess knowledge, attitude, and practice (KAP) toward infection control under patient safety. The findings revealed that most of the students (59%) had knowledge and 61% have positive attitudes toward patient safety (Ayyad *et al.*, 2024). Other research studies established that educational intervention could enhance professional patient safety culture among health workers (Agbar *et al.*, 2023).

A Malaysian study revealed that 98.9% of nursing students had good levels of knowledge with 90.3% positive attitudes toward patient safety (Zulkifli *et al.*, 2021). A cross-sectional study based on questionnaire among 172 working nurses, revealed a level of knowledge among nursing students of 58.7%, an attitude of 52.9%, and a practice of 50% towards patient safety (Wake *et al.*, 2021). Another study found that nursing students demonstrated a satisfactory level of knowledge and attitude overall, but their knowledge regarding patient safety was identified as the weakest dimension (Kılıç & Cevheroğlu, 2023). Numerous studies have shown a strong correlation between nurses' strong adherence to key principles and patient safety, as reported by Vaismoradi *et al.* (2020). Patient safety needs nurses' adequate knowledge and attitude, whether the classes are online or offline (Staines *et al.*, 2021). Interventional patient safety training can enhance the knowledge (Yilmaz & Erdem, 2024). Improving nursing students' knowledge and attitudes is always a priority in safety management (Hamid, Ismail & Sulong, 2024). New educational strategies are necessary to bridge the knowledge gap and improve the quality of care (Valença *et al.*, 2024). Another study reported that nursing students had a moderate level of knowledge about patient safety, which influenced the highest mean of 3.45 and SD of 0.94 (Al-Nawafleh, Musleh & Nawafleh, 2024). An educational intervention can enhance knowledge and attitude toward patient safety Cho *et al.*, 2022

There are limited studies on the impact of online nursing education. This study aims to assess, explore, and improve nursing students' knowledge and attitudes toward patient safety.

METHODOLOGY

A quantitative research approach.

Research Design: Descriptive Research Design followed by one group pre-test and post-test research design on patient safety was followed.

Sampling Technique:

Phase-I Random sampling technique

Phase-II Systematic random technique (1/10th of 383)

Population and Sample Size: Nursing students attending online nursing education were chosen as study participants. Sample size for Descriptive-383 and Interventional-38 following Krejcie Morgan Sampling Formula (Chaokromthong & Sintao, 2021).

Phase - I Sample Size - 383

$$n = \frac{X^2 \times N \times P \times (1-P)}{e^2 \times (N-1) + X^2 \times P \times (1-P)}$$

Where

n = Sample size

N = Population size (40,000)

P = Proportion of the population (assumed as 0.5 for unknown values)

e = Acceptable sampling error (0.5, degree of accuracy)

X² = Chi-square value for 1 degree of freedom at a 95% confidence interval (3.841)

Substituting the values:

$$n = \frac{3.841 \times 40,000 \times 0.5 \times (1-0.5)}{(0.5)^2 \times (40,000-1) + 3.841 \times 0.5 \times (1-0.5)}$$

The computed sample size was 384, but for this study, 383 was used, accounting for one-sample mortality.

2. Phase II = 38 (1/10th of 383 = 38)

Data Collection Procedure

Phase I: Data was collected with a validated WHO modified patient safety tool (WHO, 2015). The patient safety WHO modified tool was validated by 7 experts in the field of medical surgical nursing and by one microbiologist. Before, the main study data collection reliability test was done among 10 samples, and it was found reliable (r=0.7).

The main study data was collected through online google form with voluntary participation consent. The tool consists of Tool-1 demographic data, tool 2 knowledge questionnaire on patient safety and tool 3 Attitude scale on patient safety

Phase II: Pre-test data was collected on 10th October 2023 and post test data was collected on 11th November 2023.

Intervention: Workshop on Patient Safety

Table 1: Topic under Workshop on Patient Safety

Topic of Discussion	AV Aids
Patient safety, incidence and prevalence and importance on patient safety	PPT
Safety-related to the environment	Roleplay
Safety-related to infection control	Skill stations
Safety-related to medication administration	PPT, Role play
Safety-related to safe practices and fall prevention	Skill Station
Safety-related to blood and blood transfusion	Skill station
Safety-related to identification and communication	Roleplay

Data Analysis

Quantitative The nursing students analysed data from the 1st and 2nd phases using descriptive and

inferential statistics. Mean, median, standard deviation, and regression analysis describe continuous data, and frequency percentages describe categorical data. A paired t-test established the effectiveness of the workshop on knowledge and attitude toward patient safety.

Ethical Consideration

The present study received ethical permission from the institutional ethics committee of Sister Florence College of Nursing, Kolkata, India with reference number Ref/IEC/SFCON/0005 on 24th January, 2022 and informed consent was taken from participants using code number.

RESULTS

Descriptive Data

Table 2: Frequency and Percentage Distribution of Demographic Data (n=383)

Criteria	Range	Frequency	Percentage
Age in years	18-21	223	58.22%
	22-25	159	41.51%
	25 +	1	0.26%
Year of students	3 rd year GNM	94	24.54%
	4 th year B.Sc. Nursing	138	36.03%
	3 rd year B.Sc. Nursing	151	39.43%
Duration of online classes attended	6+ months	250	65.27%
	6- months	133	34.73%
Opinions about practical confidence	Need practice	294	76.76%
	Confident	89	23.24%

Table 2 reveals that the majority of nursing students were 3rd year Bachelor of Nursing students, with 151 (39.43%) belonging to the age group between 18-21 years. Of these students, 250 (65.27%) attended more than six months of online nursing education, and 294 (76.76%) expressed a lack of practical confidence.

Table 3: Knowledge, Attitude, and their Relationship Toward Patient Safety (n=383)

Knowledge and Attitude Criteria	Knowledge (f)	Knowledge (%)	Attitude (f)	Attitude (%)	r
Poor	8	2.09	9	0.35	0.36
Average	35	09.14	34	0.88	
Good	228	59.53	164	42.82	
Very Good	112	29.24	173	45.17	

To determine the relationship between knowledge and attitude toward patient safety, a regression analysis was done. Table 3 shows that there is a significant positive relationship between knowledge and attitudes toward patient safety at a 0.05 level of significance.

Second Phase: Interventional Data

Pre-test and post-test were done with mean, median, and SD and paired t-value of knowledge and attitude toward patient safety.

Table 4: Mean, Median, SD, and t-Value of Knowledge and Attitude Score (n=38)

Variables	Mean	Median	SD	Paired t-test
Pre-test Knowledge	26.76	16.15	3.61	9.23
Post-test Knowledge	29.50	19.94	5.86	
Pre-test Attitude	127.05	111.8	13.51	3.66
Post-test Attitude	131.36	119	14.11	

p<0.05 level of significance

Based on Table 4, the mean knowledge and attitude scores after the test were 29.50 and 132.36, which are higher than the mean knowledge and attitude scores before the test, which were 25.76 and 127. There is a significant t value for knowledge and attitude of 9.23 and 3.66 at a 95% confidence interval. As the calculated t-value is greater than the tabulated t-value, which is less than 3 at the 0.05 level of significance, it establishes the effectiveness of educational intervention on patient safety among nursing students.

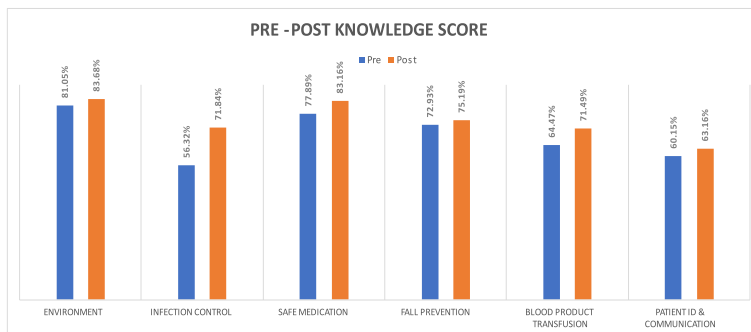


Figure 1: Dimension Wise Pre and Post-Test Knowledge Scores on Patient Safety (n=38)

Figure 1 highlights the dimension-wise pre-test knowledge gap among nursing students following online education. The figure also reveals that there was a significant enhancement of post-test knowledge scores after attending a workshop on patient safety.

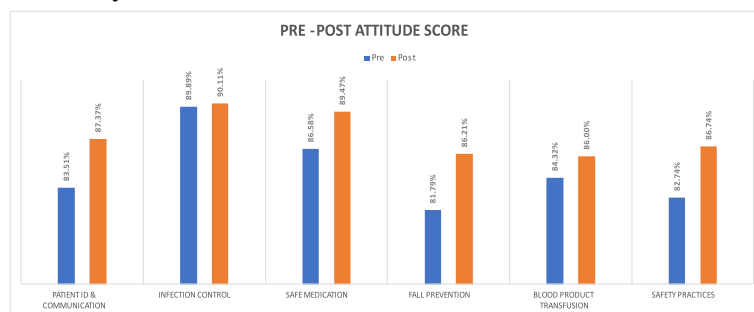


Figure 2: Dimension Wise Pre and Post-Test Attitude Scores on Patient Safety (n=38)

Figure 2 highlights that there was a dimension-wise pre-test attitude gap among nursing students following online education. The post-test attitude scores also reveal a significant enhancement toward patient safety after attending a workshop on patient safety.

DISCUSSION

The study demonstrated the influence of online nursing education and the significance of interventional workshops on patient safety, particularly in relation to nursing students' knowledge and attitudes towards safety.

In the 1st phase, Bachelor of Nursing Students attended more than six months of online classes using smartphones as educational tools. In the 3rd year, 151 (39.43%) had an opinion, 294 (76.76%) had a lack of practical confidence. The data also revealed that 228 (59.53%) and 173 (45.17%) students had good knowledge and attitude, with the mean, median, and SD being 27.09, 17.51, and 06.64, and 131.97, 117.19, and 13.37, respectively. There was a significant positive relationship between knowledge and attitude, with a score of 0.36 for patient safety.

Due to the pandemic, all universities and academic institutions began offering online teaching through real-time video lectures using Zoom or recorded lectures via Internet support (Lee & Yoo, 2024). Most of the nursing students faced moderate levels of barriers to online nursing education (Balatayo *et al.*, 2021). A study (Addae *et al.*, 2022) supports the present study's findings, revealing that only 42.8% of nursing students expressed satisfaction with internet support during their online education. In another study, conducted among

360 undergraduate nursing students at Alexandria University, Egypt, the nursing students shared that they had faced moderate levels of barriers during online education (71.7%), and they were fearful of gaps in learning (Bassiouni, Fadl & Hussien, 2023). During the pandemic, simulation or scenario-based teaching and learning was the most popular method of clinical teaching. A study supported the present study findings, which revealed that teachers most commonly used procedural simulation, role-playing, standardised patient care, and hybrid simulation during online education, accounting for 36.4%, 31.5%, 14.4%, and 9.1% of the total number (Benchadlia, Rabia & Abderrahim, 2024).

In the Phase II, the interventional workshop on patient safety enhanced the mean post-test knowledge and attitude scores to 29.44 and 132.36, more significantly than the mean pre-test knowledge and attitude the scores of 25.76 and 127 were obtained at a 0.05 level of significance with a significant knowledge and attitude *t*-value of 9.23 and 3.66, respectively.

The present study showed the nursing students faced remarkable challenges in nursing education. Despite the challenges, nursing students demonstrated a good level of resilience and perseverance (Wallace *et al.*, 2021). Another supportive study found that distance learning often results in a significant lack of student-teacher interaction during online classes, leading to decreased enthusiasm and monotony in both interactions and learning outcomes (Mbandlwa, 2021).

The present study was supported by another quasi-experimental study, which was conducted among 219 nursing students in parallel classrooms in China. In the experimental group the number of students was 113, exposed to simulation classes, and the control group of students was 106, exposed only to theoretical classes on patient safety. The data reported that the experimental group of students had better knowledge of patient safety than the control group (176.24 ± 13.73 vs. 160.87 ± 14.88) (Li *et al.*, 2023).

An integrative review study was conducted from 2011 to 2022 by searching the electronic database of the Cumulative Index of Nursing, Allied Health Literature (CINAHL), MEDLINE databases, and Google Scholar. The data indicates a learning gap and highlights the need for proper curriculum development and program structure in nursing education (Dissanayake, Dharmasena & Warnakulasuriya, 2024).

Patient safety means minimizing the risk of unnecessary damage associated with healthcare. Another cross-sectional study in Ethiopia conducted among 678 undergraduate nursing students revealed that 293 (43.2%) and 308 (45.4%) students had good knowledge and a positive attitude toward patient safety (Mohammed *et al.*, 2023). A quasi-experimental research study revealed a significant increase in post-test mean scores on patient safety competencies among nursing students (Torkaman, Sabzi & Farokhzadian, 2022).

Limitation

This study involved a relatively small sample size, which could be expanded to include students from all nursing courses for improved generalizability. Future research could also explore comparative studies examining scenarios before and after COVID-19 to gain deeper insights into the evolving challenges and trends in nursing education and practice.

CONCLUSION

Patient safety represents the foundation of healthcare quality. Nurses' knowledge and attitude are the principles components in the reduction of errors and harm associated with health care. This study revealed that 1st phase that nursing students had good theoretical knowledge and attitude but lacked clinical confidence toward patient study. But, in the 2nd phase, an educational interventional workshop on patient safety enhanced the dimension-wise knowledge and attitude toward patient safety. The study participants corrected themselves toward patient safety management. The novelty of the study is that the lacked confidence was corrected, and the nurses prepared for quality safe practice in the healthcare settings, it will help in nursing education, administration, practice, and research as a scope of implication.

Patient safety is the foundation of healthcare quality. Nurses' knowledge and attitudes are essential components in minimizing errors and harm within healthcare systems. This study identified that in the 1st phase, nursing students demonstrated good theoretical knowledge and attitudes toward patient safety but lacked clinical confidence. However, in the 2nd phase, an educational intervention workshop on patient safety

significantly improved their knowledge and attitudes across various dimensions. The participants successfully addressed their deficiencies in patient safety management, enhancing their readiness for safe and quality practice in healthcare settings.

The novelty of this study lies in its ability to bridge the gap in clinical confidence among nursing students, preparing them for effective patient safety practices. The findings have substantial implications for nursing education, administration, clinical practice, and future research. By emphasizing the importance of proper educational interventions, this study highlights a crucial step toward fostering a culture of safety and improving overall healthcare quality.

Conflict of Interest

The authors declare that they have no competing interests.

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