The Bioscan
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
20(3): S.I(3). 1547-1555, 2025 www.thebioscan.com

A study to assess the effectiveness of demonstration on knowledge and practice regarding oxygen therapy among first-year nursing students in a selected nursing college.

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DOI: 10.63001/tbs.2025.v20.i03.S.I(3).pp1547-1555

KEYWORDS:
Oxygen Therapy, Nursing Education, Demonstration, Knowledge, Practice, Skill Acquisition

Received on:
31-07-2025

Accepted on:
16-09-2025

Published on:
12-11-2025

ABSTRACT

Background: Oxygen therapy is a critical nursing procedure that requires comprehensive theoretical knowledge and precise practical skills. First-year nursing students often lack adequate exposure and competence in performing this procedure, which can impact patient safety and care quality. **Aim:** This study aimed to assess the effectiveness of demonstration as a teaching method in enhancing the knowledge and practice of oxygen therapy among first-year nursing students. **Methods:** A quasi-experimental one-group pre-test and post-test design was conducted among 300 first-year B.Sc. Nursing and GNM students in a selected nursing college. Participants were selected using purposive sampling. Data collection tools included a structured knowledge questionnaire and an observational checklist. A structured demonstration was conducted, followed by post-intervention assessments.
Results: The study revealed a significant improvement in both knowledge and practice scores after the demonstration. The mean knowledge score increased from 14.12 ± 4.85 to 22.45 ± 3.60 ($p < 0.001$), and the mean practice score improved from 13.90 ± 1.85 to 15.25 ± 1.20 ($p < 0.001$). Chi-square analysis showed a significant association between pre-test knowledge scores and selected demographic variables like age, religion, and prior exposure to oxygen therapy. **Conclusion:** Demonstration-based teaching is an effective instructional strategy that significantly enhances the cognitive and psychomotor skills of nursing students in administering oxygen therapy. Incorporating such interactive and skill-focused methods into the nursing curriculum can bridge educational gaps and improve clinical competency.

INTRODUCTION

Oxygen therapy is a crucial clinical intervention for managing patients with respiratory distress or hypoxia. It is widely used in emergency departments, intensive care units, and general wards. Administering oxygen requires knowledge about indications, delivery devices, flow rates, and safety measures to prevent

complications such as oxygen toxicity and carbon dioxide retention.

In nursing education, it is imperative that students acquire both cognitive and psychomotor competencies to administer oxygen therapy safely. First-year nursing students, however, are often limited in their clinical exposure and confidence. Traditional lecture-based teaching may fail to adequately prepare students for hands-on procedures. As a result, innovative instructional methods such as demonstration are being increasingly integrated into nursing curricula.

Demonstration provides visual, structured guidance on clinical procedures and encourages active learning. It aligns with experiential learning principles, promoting better retention and practical application. This study was conducted to evaluate the impact of demonstration on improving knowledge and clinical practice regarding oxygen therapy among novice nursing students.

METHODOLOGY

This study adopted a descriptive approach to explain each component of the research process used to evaluate the effectiveness of demonstration-based teaching on oxygen therapy among first-year nursing students.

A quasi-experimental one-group pre-test and post-test design was selected to assess changes in students' knowledge and practice following the intervention. The study utilized a quantitative research approach, enabling objective measurement of changes in student learning outcomes.

The research was conducted in a selected nursing college, where both the theoretical and practical phases were implemented. Classrooms were used for conducting the knowledge assessments, and the skills laboratory served as the venue for hands-on demonstrations and evaluations using real or simulated oxygen therapy equipment.

The population comprised first-year students from B.Sc. Nursing and General Nursing and Midwifery (GNM) programs. A total of 300 students were selected using purposive sampling, based on availability and inclusion criteria.

Inclusion Criteria:

- First-year B.Sc. Nursing or GNM students.
- Willing to participate and available for both assessments.

Exclusion Criteria:

- ANM students.
- Students with prior clinical exposure to oxygen therapy.

Two research instruments were used for data collection: a structured knowledge questionnaire and an observational practice checklist. The knowledge questionnaire included 30 multiple-choice questions assessing theoretical aspects of oxygen therapy such as indications, flow rates, delivery systems, safety measures, and complications. The practice checklist included 16 critical steps required to correctly perform the oxygen administration procedure, such as hand hygiene, preparation of equipment, patient positioning, and monitoring.

Each tool had clearly defined scoring criteria. Knowledge was categorized as poor (0–10), average (11–20), or good (21–30). Practice was categorized as poor (0–5), average (6–10), or good (11–15). These categories allowed the researcher to evaluate improvements post-intervention.

To ensure the accuracy and reliability of the tools, content validity was established through expert review, and reliability testing was carried out. The knowledge questionnaire had a Cronbach's alpha of 0.82, while the observational checklist achieved a Cohen's kappa greater than 0.75, indicating substantial agreement among evaluators.

Data collection was carried out in three phases:

- Phase 1 (Pre-test): Assessment of baseline knowledge and skills.
- Phase 2 (Intervention): Structured demonstration session using real equipment with supervised return demonstrations.
- Phase 3 (Post-test): Reassessment using the same tools to evaluate learning outcomes.

Data were analyzed using SPSS version 26. Descriptive statistics such as mean, percentage, and standard deviation were used to summarize data. Paired t-tests were employed to evaluate the effectiveness of the demonstration, and chi-square tests were used to identify associations between demographic variables and pre-test knowledge scores. A p-value of less than 0.05 was considered statistically significant.

Ethical approval was obtained from the Institutional Ethics Committee (Approval No-PUIECHR/PIMSR/00/081734/8229). Written informed consent was taken from all participants. Confidentiality and anonymity were maintained, and participants were informed about their right to withdraw from the study at any stage without academic penalty.

A pilot study was conducted with 30 students (10% of the sample size) to test the feasibility of the data collection tools and procedures. Feedback was used to revise and finalize the methodology before full-scale implementation.

RESULTS

This section presents the findings of the study based on the analysis of collected data. The results have been organized into five sub-sections for clarity:

1. Demographic profile of participants
2. Comparison of pre-test and post-test knowledge scores
3. Comparison of pre-test and post-test practice scores
4. Effectiveness of demonstration (mean, SD, and paired t-test)
5. Association between demographic variables and pre-test knowledge levels

These findings help determine whether the demonstration method significantly improved nursing students' understanding and skill performance in administering oxygen therapy.

1. Demographic Characteristics of Participants

The study included 300 first-year nursing students from B.Sc. Nursing and GNM programs. The demographic characteristics are presented below:

Table 1: Frequency and Percentage Distribution of Demographic Characteristics (N = 300)

Demographic Variable	Categories	Frequency (n)	Percentage (%)
Age	17–19 years	160	53.3%
	20–22 years	130	43.3%
	>22 years	10	3.4%
Gender	Male	70	23.3%
	Female	230	76.7%
Residential Area	Urban	185	61.7%
	Rural	115	38.3%
Type of Family	Nuclear	210	70.0%
	Joint	90	30.0%
Religion	Hindu	250	83.3%
	Muslim	25	8.3%
	Christian	25	8.3%
Education Stream	Science	205	68.3%
	Arts/Commerce	95	31.7%
Prior Knowledge	Yes	110	36.7%
	No	190	63.3%
Source of Information	Books/Classes	60	20.0%

	Internet	30	10.0%
	Peer Discussion	20	6.7%

2. Pre-test and Post-test Knowledge Scores

Knowledge levels were evaluated before and after the demonstration. A noticeable improvement was seen post-intervention.

Table 2: Distribution of Participants Based on Knowledge Levels (N = 300)

Knowledge Level	Pre-test (n, %)	Post-test (n, %)
Poor (0–10)	75 (25.0%)	10 (3.3%)
Average (11–20)	150 (50.0%)	84 (28.0%)
Good (21–30)	75 (25.0%)	206 (68.7%)

There was a significant shift from lower to higher knowledge categories after the intervention, indicating effectiveness of the demonstration method.

3. Pre-test and Post-test Practice Scores

Students' practical skills in oxygen therapy were also assessed before and after the demonstration.

Table 3: Distribution of Participants Based on Practice Levels (N = 300)

Practice Level	Pre-test (n, %)	Post-test (n, %)
Poor (0–5)	12 (4.0%)	4 (1.3%)
Average (6–10)	16 (5.3%)	8 (2.7%)
Good (11–15)	272 (90.7%)	288 (96.0%)

The number of students demonstrating good practice increased following the intervention, supporting the value of demonstration in skill acquisition.

4. Effectiveness of Demonstration (Paired t-test Analysis)

Statistical analysis using paired t-test confirmed that the demonstration led to a

significant improvement in both knowledge and practice scores.

Table 4: Mean ± SD and Paired t-test Result for Knowledge and Practice Scores (N = 300)

Parameter	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Difference	t-value	p-value
Knowledge Score	14.12 ± 4.85	22.45 ± 3.60	8.33	16.72	< 0.001
Practice Score	13.90 ± 1.85	15.25 ± 1.20	1.35	11.03	< 0.001

The results showed a statistically significant difference in the mean scores, indicating that the demonstration method effectively improved learning outcomes.

5. Association Between Demographic Variables and Pre-test Knowledge

Chi-square tests were used to assess associations between demographic variables and pre-test knowledge scores.

Table 5: Association Between Demographic Variables and Pre-test Knowledge Score (Chi-square Test)

Variable	**Chi-square Value**	**df**	**p-value**	**Interpretation**
Age	9.81	2	0.007	Significant
Gender	2.41	1	0.12	Not Significant
Residential Area	1.87	1	0.17	Not Significant
Family Type	0.92	1	0.33	Not Significant
Religion	10.56	2	0.005	Significant
Education Stream	3.72	1	0.05	Borderline Significant
Prior Knowledge	11.62	1	0.001	Highly Significant

The results indicate that age, religion, and prior knowledge had statistically significant associations with the level of pre-test knowledge.

DISCUSSION

The findings of this study demonstrate a substantial improvement in both knowledge and practical skills among first-year nursing students following a demonstration-based educational intervention on oxygen therapy. This aligns with previous literature emphasizing the efficacy of demonstration as a powerful tool in nursing education for translating theoretical understanding into clinical competence.

Before the intervention, a considerable proportion of students displayed only average or poor levels of knowledge and practice regarding oxygen therapy. Post-intervention analysis revealed a significant shift, with the majority of students attaining good knowledge and clinical practice scores. This improvement suggests that demonstration provides a meaningful learning experience by engaging multiple senses and reinforcing step-by-step procedural understanding.

The paired t-test results showed statistically significant gains in both knowledge and practice domains ($p < 0.001$), indicating that the demonstration session effectively bridged the learning gap. The mean knowledge score increased by over 8 points, and the mean practice score improved by more than 1 point. These gains reflect not just better comprehension but also improved procedural execution, which is crucial for safe patient care.

These results are consistent with the studies of Sundaramoorthy & Jayalakshmi (2020), who found demonstration methods to be superior to lecture-based instruction in terms of skill retention and application. Similarly, Mohan et al. (2019) observed a 45% improvement in knowledge following hands-on demonstration, which closely parallels the findings of the current study.

Demographic analysis further revealed significant associations between age, religion, and prior exposure to oxygen therapy with baseline knowledge levels. Students with previous exposure to information about oxygen therapy had higher initial knowledge, highlighting the importance of background learning and reinforcement. However, other demographic variables such as gender, residential area, and family type showed no significant impact, suggesting that educational interventions like demonstration can be universally beneficial regardless of background.

These findings underscore the need to integrate demonstration-based learning more systematically into the nursing curriculum. It helps in building confidence, promoting clinical preparedness, and minimizing errors in real-life settings. Additionally, incorporating such methods early in the nursing program sets a strong foundation for students to handle more complex procedures in future clinical rotations.

In conclusion, the study validates demonstration as a highly effective pedagogical strategy to improve student competency in essential nursing procedures such as oxygen therapy. This model can be replicated and scaled across other

institutions to enhance clinical readiness and ensure quality nursing education.

Conflict of Interest

The authors declare no conflict of interest related to the conduct or reporting of this research.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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