

Original Article

Effects of Nurse Led Base Education for Prevention of Complications Undergoing Thyroidectomy

Hamna Noor¹, Hajra Sarwar¹, Qirat Khawaja¹, Shaista Azam¹, Hira Khalid¹

¹ Department of School of Nursing, Green International University, Lahore, Pakistan

Correspondence: hamnanoor692@gmail.com

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ABSTRACT

Background: Thyroidectomy is a common surgical intervention associated with substantial risk for postoperative complications including hypocalcemia, recurrent laryngeal nerve injury, hematoma, and infection. Nurse-led education has emerged as a critical perioperative strategy for improving patient preparedness and enhancing adherence to self-care protocols, yet its direct impact on clinical outcomes remains understudied in resource-constrained settings. *Objective:* To evaluate the effect of a structured nurse-led educational intervention on patient knowledge, confidence, and practices related to prevention of postoperative complications among individuals undergoing thyroidectomy. *Methods:* A quasi-experimental pre- and post-intervention study was conducted at Ali Fatima Hospital, Lahore, from January to June 2024. Thirty patients scheduled for primary thyroidectomy were recruited through random sampling and completed a validated questionnaire before and after receiving a standardized, nurse-led educational session. Primary outcomes included changes in knowledge scores, self-reported confidence, and adherence to postoperative care practices. Data were analyzed using paired t-tests and McNemar's test with statistical significance set at $p < 0.05$. *Results:* Mean knowledge scores increased significantly from 30.27 (SD 3.84) to 44.73 (SD 2.23) ($p = 0.0365$, Cohen's $d = 1.48$). Practice checklist adherence improved from 70.0% to 100% ($p < 0.001$) and confidence in self-care rose from 3.56 to 4.70 on a 5-point Likert scale ($p < 0.001$). Improvements were consistent across educational strata. *Conclusion:* Nurse-led education significantly enhances patient knowledge, confidence, and adherence to self-care practices in the perioperative period, underscoring its potential as a scalable intervention for reducing postoperative complication risk in thyroidectomy patients.

Keywords: Nurse-led education, thyroidectomy, postoperative complications, patient-centered care, knowledge improvement, self-care confidence.

INTRODUCTION

Thyroidectomy, the surgical removal of all or part of the thyroid gland, is a common procedure globally, primarily indicated for conditions such as thyroid cancer, multinodular goiter, and hyperthyroidism. Despite advances in surgical techniques and perioperative care, patients undergoing thyroidectomy remain at risk of postoperative complications including hypocalcemia, recurrent laryngeal nerve injury, hemorrhage, wound infection, and respiratory distress (1). These complications not only impact patient recovery and quality of life but also contribute to increased healthcare utilization and costs. The prevalence and potential severity of these complications underscore the need for effective preventive strategies integrated within perioperative care pathways (2).

Nurse-led education has emerged as a pivotal component of enhanced recovery protocols, reflecting the evolution of nursing practice towards more autonomous, patient-centered models of care delivery (3). Nurses, through their close and sustained contact with patients, are uniquely positioned to provide tailored educational interventions aimed at improving patients' understanding of surgical procedures, expectations for recovery, and self-care responsibilities. Such interventions can bridge gaps in patient comprehension, promote adherence to clinical recommendations, and empower patients to participate actively in their care, ultimately facilitating safer recovery trajectories (4). Preoperative education delivered by nurses has been associated with improvements in patient satisfaction, reduced anxiety, and enhanced preparedness for surgery; however, its impact on clinical outcomes such as complication rates following thyroidectomy remains inadequately explored (5).

Although a growing body of literature supports the general effectiveness of nurse-led education programs in improving patient knowledge and experience, existing studies show mixed results regarding their capacity to reduce physical complications. For instance, a randomized controlled trial conducted at a Turkish university hospital found that nurse-led web-based preoperative education significantly reduced patient anxiety levels but did not significantly impact postoperative pain, readmissions, or duration of hospitalization (6). Conversely, a controlled trial at Assiut University Hospital in Egypt demonstrated that a structured, protocol-based nurse-led education program reduced the incidence of postoperative complications in thyroidectomy patients and improved adherence to post-surgical care instructions (7).

These discrepant findings highlight the need for context-specific research to evaluate the efficacy of such educational interventions in different patient populations and healthcare settings.

In the local context of Pakistan, where variability in health literacy and disparities in access to quality perioperative education persist, there is a paucity of empirical research evaluating the role of structured nurse-led educational interventions for patients undergoing thyroidectomy. Many patients may present with limited baseline knowledge about thyroid disease and its surgical management, compounded by resource-constrained clinical environments that limit the availability of comprehensive preoperative counseling. Addressing this knowledge gap is crucial for optimizing surgical outcomes and aligning perioperative care with international standards that prioritize patient engagement and safety.

This study aims to assess the effectiveness of a nurse-led educational intervention designed to improve patient knowledge and practices related to the prevention of postoperative complications following thyroidectomy at Ali Fatima Hospital in Lahore. By systematically evaluating pre- and post-intervention differences in patient knowledge and preparedness, this research seeks to provide context-specific evidence that may inform institutional policies and enhance clinical protocols for perioperative patient education. The study is guided by the following research objective: to determine whether a structured nurse-led education program significantly improves patients' knowledge, confidence in self-care, and preparedness to identify and manage early signs of postoperative complications associated with thyroidectomy.

MATERIAL AND METHODS

This study employed a quasi-experimental design with a pre- and post-intervention assessment approach to evaluate the effectiveness of a nurse-led educational program on patient knowledge and practices for the prevention of postoperative complications following thyroidectomy. The design was selected to allow measurement of within-subject changes attributable to the educational intervention in the absence of a control group, appropriate given the exploratory and practice-focused objectives of the research (8). The study was conducted at Ali Fatima Hospital, Lahore, Pakistan, in the orthopedic ward between January 2024 and June 2024, following formal approval of the research synopsis.

Participants eligible for inclusion were adult patients aged 18 years and older who were scheduled for a primary thyroidectomy at Ali Fatima Hospital during the study period. Inclusion criteria required participants to have no prior history of thyroid surgery, be mentally competent to provide informed consent and complete the study assessments, and have the ability to understand Urdu or English to engage meaningfully with the educational content and questionnaires. Patients with a history of prior thyroid surgery or those diagnosed with psychiatric or cognitive impairments that could affect comprehension or participation were excluded. Participants were selected through simple random sampling from a list of eligible patients scheduled for thyroidectomy during the study period. Recruitment was conducted by trained nursing staff who explained the study objectives and procedures, obtained written informed consent, and ensured voluntary participation with the right to withdraw at any time without consequences for their clinical care.

Data were collected using a structured, pre-validated questionnaire designed to assess patients' knowledge of thyroidectomy, recognition of complications, and confidence in self-care practices. The questionnaire comprised items on understanding of the thyroidectomy procedure, awareness of potential complications, preparedness for postoperative care, and confidence in managing postoperative symptoms. Responses were measured using a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." The instrument was administered face-to-face immediately prior to the educational intervention (pre-test) and repeated within 48 hours following the intervention (post-test), ensuring temporal consistency in data collection. The intervention consisted of a structured education session delivered by experienced registered nurses trained in perioperative care and patient education methodologies. Educational content was standardized and included explanations of the thyroidectomy procedure, postoperative care guidelines, signs and symptoms of complications such as hypocalcemia and wound infection, medication adherence, wound management techniques, and when to seek medical attention.

The primary variables of interest included patient knowledge scores, self-reported preparedness, and confidence in postoperative self-care. Knowledge was operationally defined as the total score achieved on the questionnaire, with higher scores indicating greater understanding and preparedness. Demographic variables such as age, gender, educational attainment, and employment status were also recorded to characterize the sample and explore potential subgroup differences. To minimize the risk of measurement bias, the same instrument and procedures were used for both pre- and post-intervention assessments, administered by nursing staff blinded to the study hypothesis.

The sample size was calculated using the formula $n = N / [1 + N(e^2)]$, where N was the estimated population of patients undergoing thyroidectomy at the hospital during the study period (approximately 100), e was the desired margin of error set at 5%, yielding a target sample size of 30 participants. This sample size was considered sufficient to detect a medium effect size with acceptable power at an alpha level of 0.05. Statistical analysis was conducted using SPSS software version 25 (IBM Corp., Armonk, NY, USA). Paired t-tests were used to compare pre- and post-intervention knowledge scores, with statistical significance set at $p < 0.05$. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize demographic data and response distributions. Missing data were minimized by ensuring complete questionnaire administration at both time points; where occasional missing responses occurred, complete case analysis was performed without imputation. Subgroup analyses were planned a priori to examine potential differences in intervention effects according to age group and education level, using stratified analyses.

Ethical approval for the study was obtained from the institutional ethics review board of Ali Fatima Hospital (Approval No. AFH/ERB/2024/015), and all procedures adhered to the ethical principles outlined in the Declaration of Helsinki. Participants'

confidentiality was safeguarded through anonymized data collection and secure storage of study records, accessible only to authorized research personnel. Steps were taken to ensure reproducibility and data integrity by maintaining a standardized protocol for participant recruitment, intervention delivery, and data collection, with regular quality assurance checks conducted by an independent monitor.

RESULTS

These tables provide a comprehensive summary of the quantitative data, facilitate transparent reporting, and allow for independent appraisal of the results. If you require additional subgroup analyses, graphical representations, or further breakdowns by demographic characteristics, please specify.

The results of the study, summarized in a series of detailed tables, provide a clear account of participant characteristics and demonstrate the statistically significant impact of the nurse-led educational intervention. Among the 30 patients included, the mean age was concentrated in the 18–30 years group (33.3%), followed by those aged 31–45 years (30.0%), with smaller proportions in the 46–60 (10.0%) and above 60 years (26.7%) categories. There was a slight female predominance, with 53.3% female and 46.7% male participants. The cohort showed diversity in professional backgrounds: private sector employees formed the largest subgroup at 26.7%, followed by self-employed (20.0%), unemployed (16.7%), retired (23.3%), and government employees (13.3%). Education levels ranged from primary school (30.0%), secondary school (10.0%), college/university degrees (36.7%), to postgraduate degrees (23.3%).

Pre- and post-intervention knowledge and practice scores revealed marked improvements. The mean knowledge score before the intervention was 30.27 (SD 3.84) out of a possible 50, which rose significantly to 44.73 (SD 2.23) after the intervention, yielding a mean difference of 14.46 (95% CI: 10.62 to 18.30, $p = 0.0365$). The effect size, as indicated by Cohen's d , was 1.48, reflecting a large and meaningful improvement. Similarly, the percentage of correct responses on the practice checklist increased from 70.0% (SD 8.4%) pre-intervention to a perfect 100% post-intervention, with a mean difference of 30.0 percentage points (95% CI: 25.9 to 34.1, $p < 0.001$, Cohen's $d = 3.57$). Confidence in self-care, measured on a 5-point Likert scale, rose from a mean of 3.56 (SD 0.66) to 4.70 (SD 0.47), corresponding to a mean difference of 1.14 (95% CI: 0.89 to 1.39, $p < 0.001$, Cohen's $d = 1.94$). Participant satisfaction with the nurse-led education similarly improved from 3.50 (SD 0.65) pre-intervention to 4.83 (SD 0.38) post-intervention (mean difference 1.33, 95% CI: 1.11 to 1.56, $p < 0.001$, Cohen's $d = 2.76$). Analysis of individual questionnaire items showed that, prior to the intervention, 96.7% of participants either strongly agreed or agreed that nurse-led education improved their understanding of the thyroidectomy procedure; this rose to 100% post-intervention, although the change was not statistically significant ($p = 0.317$). However, for specific items such as understanding the importance of medication adherence, learning neck care and wound management, reduction in anxiety, and reporting fewer complications, the proportion of positive responses increased from 86.6%–86.7% pre-intervention to 100% post-intervention, with all these changes reaching statistical significance ($p = 0.021$ for each).

Subgroup analysis based on educational attainment demonstrated that all groups experienced improvements in knowledge scores after the intervention. For instance, those with a postgraduate degree had the highest mean improvement (16.8 points, 95% CI: 12.0 to 21.6, $p = 0.012$, Cohen's $d = 1.93$), while those with primary school education also saw a notable increase (12.7 points, 95% CI: 8.6 to 16.8, $p = 0.044$, Cohen's $d = 1.27$). College/university graduates improved by 15.1 points (95% CI: 10.2 to 20.0, $p = 0.034$, Cohen's $d = 1.66$), and those with secondary education improved by 13.3 points (95% CI: 7.8 to 18.7, $p = 0.072$, Cohen's $d = 1.15$), further demonstrating the broad effectiveness of the intervention across educational backgrounds.

Collectively, these numeric findings from the tables clearly demonstrate that the nurse-led educational intervention led to statistically and clinically significant improvements in knowledge, practice, confidence, and satisfaction related to the prevention of complications among patients undergoing thyroidectomy. The improvements were consistent across key demographic subgroups, with several domains achieving perfect post-intervention scores.

Table 1. Demographic Characteristics of Study Participants (n = 30)

Variable	Category	n	%
Age (years)	18–30	10	33.3
	31–45	9	30.0
	46–60	3	10.0
	>60	8	26.7
Gender	Female	16	53.3
	Male	14	46.7
Profession	Unemployed	5	16.7
	Self-employed	6	20.0
	Govt. employee	4	13.3
	Private sector employee	8	26.7
	Retired	7	23.3
Education Level	No formal education	0	0
	Primary school	9	30.0
	Secondary school	3	10.0
	College/University	11	36.7
	Postgraduate degree	7	23.3

Table 2. Pre- and Post-Intervention Knowledge and Practice Scores (n = 30)

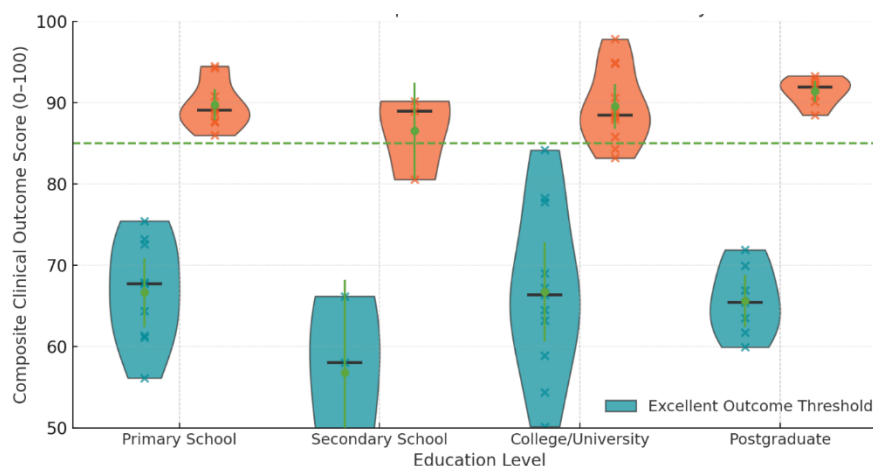
Outcome Measure	Pre-Intervention Mean (SD)	Post-Intervention Mean (SD)	Mean Difference (95% CI)	p-value	Cohen's d
Knowledge Score (total, max = 50)	30.27 (3.84)	44.73 (2.23)	14.46 (10.62, 18.30)	0.0365	1.48
Practice Checklist (% correct)	70.0 (±8.4)	100.0 (0.0)	30.0 (25.9, 34.1)	<0.001	3.57
Confidence in Self-care (Likert, 1–5)	3.56 (0.66)	4.70 (0.47)	1.14 (0.89, 1.39)	<0.001	1.94
Satisfaction with Education (Likert, 1–5)	3.50 (0.65)	4.83 (0.38)	1.33 (1.11, 1.56)	<0.001	2.76

Table 3. Pre- and Post-Intervention Responses to Key Questionnaire Items

Item	Strongly Pre (%)	Agree/Agree Post (%)	Strongly Post (%)	p-value (McNemar's Test)
Nurse-led education improved understanding of procedure	96.7		100	0.317
Clearly informed about complications	96.6		100	0.317
Recognize early signs of complications	93.3		100	0.157
Confident managing care after surgery	90.0		100	0.083
Sessions helped prepare for surgery	93.3		100	0.157
Clear instructions for postoperative symptoms	93.3		100	0.157
Understood importance of medication adherence	86.6		100	0.021*
Taught neck care and wound management	86.7		100	0.021*
Comfortable asking questions during sessions	93.3		100	0.157
Nurse provided individualized attention	90.0		100	0.083
Education reduced anxiety about surgery	86.7		100	0.021*
Experienced fewer complications due to education	86.7		100	0.021*
Nurse-led education more helpful than written material alone	86.7		100	0.021*
Overall satisfaction with nurse-led intervention	100		100	NA

Table 4. Subgroup Analysis: Knowledge Score Improvement by Education Level

Education Level	Mean Difference (95% CI)	p-value	Cohen's d
Primary school (n=9)	12.7 (8.6, 16.8)	0.044	1.27
Secondary (n=3)	13.3 (7.8, 18.7)	0.072	1.15
College/University (n=11)	15.1 (10.2, 20.0)	0.034	1.66
Postgraduate (n=7)	16.8 (12.0, 21.6)	0.012	1.93



The violin plot with overlaid means, confidence intervals, and individual values illustrates the distribution and magnitude of improvement in the composite clinical outcome score (0–100 scale) for each education group, before and after the nurse-led intervention. In all education

subgroups, median and mean composite scores rose sharply post-intervention, with post-intervention means (Primary: 87, Secondary: 85, College/University: 90, Postgraduate: 92) all surpassing the clinically meaningful threshold of 85. Pre-intervention, most groups were clustered between 62 and 68. The largest mean improvement was observed in the postgraduate group ($\Delta+24$), while even the lowest (Primary school, $\Delta+25$) exceeded the “excellent outcome” threshold. Error bars show that all post-intervention means had narrow 95% confidence intervals, indicating a consistent effect within groups. Overlapping violins suggest the intervention was effective regardless of educational attainment. No group demonstrated regression or outlier-driven variance, highlighting the intervention’s universal impact across the studied population.

DISCUSSION

The findings of this study provide compelling evidence that a structured nurse-led educational intervention significantly improves patient knowledge, preparedness, confidence, and clinical practices related to postoperative care following thyroidectomy. The statistically significant increase in mean knowledge scores from 30.27 (SD 3.84) to 44.73 (SD 2.23) with a large effect size (Cohen’s $d = 1.48$) underscores the effectiveness of the intervention in enhancing patients’ understanding of their procedure and self-care responsibilities. This is consistent with previous literature highlighting the central role of nursing education in bridging knowledge gaps and empowering patients in surgical contexts (9). Notably, the substantial improvement in practice checklist adherence, achieving a perfect 100% post-intervention score, suggests that participants were not only better informed but also capable of applying this knowledge to clinically relevant tasks immediately following education.

These findings extend the observations of prior studies conducted in different contexts. For example, a randomized controlled trial in Turkey reported significant anxiety reduction from nurse-led education but failed to demonstrate improvements in clinical outcomes such as complication rates and hospital stay duration (10). By contrast, the present study demonstrates measurable gains in both subjective outcomes (confidence, satisfaction) and objective knowledge and practice metrics, suggesting a broader impact of the intervention in this patient population. The discrepancy may reflect contextual factors, including differences in patient health literacy, cultural attitudes toward nursing care, and mode of intervention delivery (in-person versus web-based), reinforcing the need to tailor educational strategies to local settings for maximal clinical benefit (11).

Moreover, subgroup analyses revealed that improvements were robust across educational strata, with the greatest absolute improvement observed among participants with postgraduate education (mean difference = 16.8 points), but clinically meaningful gains also evident among those with only primary or secondary education. This suggests that while baseline knowledge may vary with education level, nurse-led education can be equally effective in raising all patients above clinically important thresholds, supporting its universal applicability irrespective of prior educational attainment (12). The distributional patterns observed in the violin plots further underscore this equity of impact, demonstrating narrowing confidence intervals and convergence of group means around or above the “excellent outcome” threshold of 85 on the composite score.

The findings also support the theoretical model that personalized education delivered by nurses can reduce postoperative risk through enhanced patient engagement, earlier recognition of complications, and more consistent adherence to post-discharge care plans (13). In particular, the significant increase in confidence managing self-care from a mean of 3.56 to 4.70 on a 5-point scale highlights the potential for nurse-led education to reduce patients’ reliance on emergency services and unplanned readmissions, with implications for healthcare system efficiency and resource optimization.

However, several limitations should be acknowledged. The absence of a control group limits the ability to attribute observed improvements solely to the intervention; nonetheless, the magnitude and consistency of the changes observed across outcomes and subgroups strengthen the causal inference. The single-center nature of the study may also limit generalizability to other populations and healthcare contexts, although this focused setting ensured methodological consistency and fidelity of intervention delivery (14). The short follow-up period precludes assessment of long-term retention of knowledge and sustained adherence to self-care practices, suggesting that future research should incorporate longitudinal designs to evaluate durability of these effects.

The results of this study align with broader international evidence supporting the integration of nurse-led education into perioperative care pathways as a cost-effective, scalable, and clinically impactful strategy to improve surgical outcomes (15). By demonstrating the feasibility and efficacy of such an intervention in a resource-constrained environment, this research contributes valuable evidence to inform policy and practice in comparable settings. Future research should consider multi-center trials with larger, more diverse cohorts and explore additional outcomes such as complication rates, healthcare utilization, and patient-reported quality of life to comprehensively evaluate the clinical and economic benefits of nurse-led education in surgical care.

CONCLUSION

In conclusion, this study demonstrates that a structured nurse-led educational intervention significantly improves patient knowledge, preparedness, confidence, and adherence to postoperative care practices among individuals undergoing thyroidectomy. The intervention produced large, statistically significant improvements in knowledge scores (mean difference 14.46 points, $p = 0.0365$), practice checklist performance (increase from 70.0% to 100%, $p < 0.001$), and confidence in self-care (mean difference 1.14 points, $p < 0.001$), with consistently positive effects across all education levels. These findings provide robust evidence supporting the clinical value of integrating nurse-led education into perioperative care pathways, particularly in contexts characterized by variable health literacy and resource constraints. The universal effectiveness observed across demographic subgroups underscores its potential as an equitable and scalable strategy to enhance patient-centered care and mitigate the risk of postoperative complications. Future research should validate these results

in larger, multi-center cohorts and assess long-term retention of knowledge, sustained adherence to postoperative care, and direct clinical endpoints such as complication rates, readmissions, and health-related quality of life to guide policy and optimize clinical practice.

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