e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(5); 1876-1883

Original Research Article

Thyroidectomy Outcomes in a Resource-Limited Setting: A 3-Year Audit of Clinical Practice

Kshitiranjan Das[1], Pramod Chandra Pathy[2], Ashutosh Hota[3]

[1]Senior Resident, Department of Head and Neck Surgery, Acharya Harihar Post Graduate Institute of Cancer (AHPGIC), Cuttack, Odisha, India
[2]Professor and Head, Department of Head and Neck Surgery, AHPGIC, Cuttack, Odisha, India
[3]Associate Professor, Department of Head and Neck Surgery, AHPGIC, Cuttack, Odisha, India

Received: 01-01-2026 / Revised: 25-04-2026 / Accepted: 12-05-2026
Corresponding Author: Dr. Kshitiranjan Das
Conflict of interest: Nil

Abstract

Background: Thyroid surgery constitutes one of the most frequently performed endocrine procedures globally. In resource-constrained tertiary care settings of low- and middle-income countries (LMICs), outcomes data are scarce, infrastructure limitations affect perioperative management, and complication rates may differ from those reported in high-income settings. Systematic audits from such environments are essential to guide practice improvement.

Aim: To evaluate the surgical profile, histopathological spectrum, perioperative outcomes, and complication rates of thyroidectomy performed over a 36-month period at the Department of Head and Neck Surgery, AHPGIC, Cuttack.

Methods: A prospective observational study was conducted from June 2023 to June 2026 comprising 50 consecutive patients who underwent thyroidectomy. Demographic data, preoperative workup, operative details, histopathology, and postoperative outcomes were recorded and analysed using descriptive statistics, chi-square test, and Fisher's exact test. Statistical significance was set at $p < 0.05$.

Results: The study included 50 patients with a mean age of 38.7 ± 12.4 years; females predominated (82.0%). Total thyroidectomy was the most common procedure (48.0%). Papillary thyroid carcinoma was the most frequent malignancy (20.0%). The overall complication rate was 40.0%; transient hypocalcaemia occurred in 16.0% and transient recurrent laryngeal nerve (RLN) palsy in 8.0%. Permanent complication rates were low (hypocalcaemia 4.0%, RLN palsy 2.0%). Complication rates were significantly higher following total thyroidectomy compared to other procedures ($p = 0.011$).

Conclusion: Thyroidectomy can be performed with acceptable outcomes in a resource-limited tertiary cancer centre. Systematic audit, structured perioperative protocols, and surgeon training remain pivotal to sustaining safety standards. These findings contribute to the evidence base for thyroid surgery in LMICs and underline the need for ongoing quality improvement initiatives.

Keywords: Thyroidectomy; Resource-Limited Setting; Complication; Hypocalcaemia; Recurrent Laryngeal Nerve; Audit; LMIC; Head and Neck Surgery.

DOI: 10.25258/ijcpr.18.5.299

Introduction

Thyroid disorders collectively represent one of the most prevalent endocrine conditions worldwide, with surgical intervention remaining the cornerstone of definitive treatment for malignant, compressive, and functionally refractory thyroid disease. The global burden of thyroid neoplasms has grown substantially over recent decades, with the incidence of thyroid cancer rising more than three-fold in many regions, largely attributable to improved diagnostic capabilities and increased surveillance.[1]

In India, thyroid diseases occupy a position of particular epidemiological significance. Iodine deficiency, endemic goitre, and the rising tide of thyroid malignancies converge to produce a substantial patient burden at tertiary care centres, especially in states such as Odisha where access to endocrine surgical specialists remains limited.[2] The state of Odisha, with a population exceeding 46 million, has few dedicated head and neck surgical units, making institutions such as the Acharya Harihar Post Graduate Institute of Cancer

(AHPGIC), Cuttack, pivotal referral destinations for complex thyroid pathology.

Thyroidectomy, while a well-codified surgical procedure, carries inherent risks of significant morbidity including recurrent laryngeal nerve (RLN) palsy, post-thyroidectomy hypocalcaemia, bleeding, and infection. Published complication rates in high-income countries from high-volume centres range from 1% to 10% for RLN injury and 1% to 50% for biochemical hypocalcaemia depending on the extent of surgery and case complexity.[3,4] In contrast, outcomes data from resource-constrained environments—where limitations in neuromonitoring technology, intensive care support, prompt laboratory access, and calcium supplementation protocols are prevalent—remain sparse.

A growing body of evidence emphasises the importance of institutional audits in driving quality improvement in surgical practice. The World Health Organization's Global Initiative for Emergency and Essential Surgical Care and similar frameworks have advocated for systematic perioperative data collection in LMICs as a foundational step toward improving surgical safety.[5] Clinical audits serve as a structured mechanism to identify deviations from best practice, benchmark outcomes against published standards, and implement targeted corrective measures.

Several studies from South Asian and sub-Saharan African institutions have documented that thyroid surgery in resource-limited settings is feasible but associated with higher complication rates when compared with international benchmarks, particularly where intraoperative nerve monitoring (IONM), parathyroid autofluorescence, and high-volume surgical practice are unavailable.[6] The absence of routine calcium and parathyroid hormone (PTH) assays in the immediate postoperative period further complicates management.

Few systematic audits of thyroid surgical practice have been published from dedicated oncological tertiary centres in eastern India. The present study was therefore designed to comprehensively evaluate patient demographics, operative profile, histopathological spectrum, and perioperative outcomes of thyroidectomy performed at AHPGIC, Cuttack, over a 36-month period. It is envisaged that the findings will inform institutional quality improvement and contribute to the regional and national evidence base for thyroid surgery in comparable settings.[7]

Materials and Methods

Study Design and Setting: This was a prospective observational study conducted in the Department of Head and Neck Surgery at AHPGIC, Cuttack, from June 2023 to June 2026 (36 months). AHPGIC is a dedicated regional cancer institute and the principal tertiary referral centre for head and neck malignancies in the state of Odisha, catering to patients predominantly from economically underprivileged backgrounds.

Sample Size Calculation: The sample size was calculated using the formula for estimation of a single proportion with finite population correction:

$$n = Z^2\alpha/2 \times p(1 - p) / d^2$$

Where: $Z\alpha/2 = 1.96$ (for 95% confidence level), $p = 0.20$ (estimated complication rate based on published literature from comparable settings), $d = 0.10$ (allowable margin of error). Substituting values: $n = (1.96)^2 \times 0.20 \times 0.80 / (0.10)^2 = 3.8416 \times 0.1600 / 0.0100 = 0.6147 / 0.0100 = 61.47$, rounded up to 62. Considering the resource-constrained context and pilot audit nature of the study, a pragmatic convenience sample of 50 consecutive eligible patients was enrolled, representing a minimum dataset sufficient for descriptive statistical analysis consistent with published institutional audits from similar settings. The shortfall from the calculated sample size of 62 is acknowledged as a limitation; however, the achieved sample is adequate for the descriptive and comparative analyses reported.

Inclusion and Exclusion Criteria: All consecutive patients aged 18 years and above who underwent thyroid surgery under general anaesthesia during the study period were eligible for inclusion. Patients who declined participation, those with incomplete operative or follow-up records, and patients undergoing emergency surgery for airway compromise not classifiable under elective thyroidectomy categories were excluded. Paediatric patients (age < 18 years) were also excluded.

Preoperative Workup: All patients underwent a standardised preoperative evaluation comprising detailed clinical history, examination, thyroid function tests (TFT) including serum TSH, free T3, and free T4; serum calcium and albumin; neck ultrasonography; fine needle aspiration cytology (FNAC) classified according to the Bethesda System for Reporting Thyroid Cytopathology (BSRTC); computed tomography (CT) of the neck and thorax where indicated (Bethesda V/VI or large goitres); and indirect laryngoscopy for preoperative vocal cord assessment. Patients with hyperthyroidism were rendered euthyroid preoperatively with antithyroid drugs and/or beta-blockers as appropriate.

Surgical Technique: All procedures were performed by surgeons of the Department of Head and Neck Surgery under standardised general anaesthesia with endotracheal intubation. Surgery

was performed in the standard supine position with neck extension. A collar incision in a natural skin crease was used in all cases.

The strap muscles were divided or retracted depending on gland size. Systematic identification and preservation of the RLN was carried out under loupe magnification; intraoperative nerve stimulation was employed when feasible using a standard handheld nerve stimulator. Parathyroid glands were identified and preserved in situ or autotransplanted into the sternocleidomastoid muscle when devascularised.

The extent of surgery (total thyroidectomy, near-total thyroidectomy, hemithyroidectomy with isthmectomy, completion thyroidectomy, or subtotal thyroidectomy) was determined by preoperative cytology, functional status, gland size, and bilateral versus unilateral pathology, following institutional protocols informed by current guidelines.

Postoperative Management and Outcome Measures: All patients were monitored in the recovery ward followed by the surgical ward. Serum calcium was measured at 12 hours and 24 hours post-operatively. Postoperative hypocalcaemia was defined as serum calcium < 8.0 mg/dL or symptomatic hypocalcaemia (Chvostek or Trousseau signs). Vocal cord mobility was assessed by indirect laryngoscopy or flexible nasopharyngoscopy at 48 hours and at 6 weeks. Transient complications were defined as those resolving within 6 months; permanent complications were those persisting beyond 6 months. Other outcomes recorded included wound infection, seroma formation, post-operative bleeding requiring re-exploration, hospital stay duration, and mortality.

Histopathological Analysis: All operative specimens were processed in the Department of Pathology at AHPGIC and reported according to the WHO Classification of Tumours of Endocrine Organs. Histopathological findings were correlated with preoperative FNAC (Bethesda category) to assess the concordance between preoperative cytological classification and final pathological diagnosis.

Statistical Analysis: Data were entered and analysed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA) and Microsoft Excel 2019. Descriptive statistics were used to summarise continuous variables as mean ± standard deviation (SD) or median with interquartile range (IQR), and categorical variables as frequencies and percentages. The chi-square test or Fisher's exact test was applied to compare categorical outcomes. A two-tailed p-value of < 0.05 was considered statistically significant.

Results

Demographic and Clinical Profile: A total of 50 patients underwent thyroidectomy during the study period. The mean age was 38.7 ± 12.4 years (range: 19–68 years). The majority of patients fell within the 30–50-year age group (56.0%). The female-to-male ratio was 4.6:1, with 41 females (82.0%) and 9 males (18.0%). As this is a single-cohort descriptive study, formal significance testing for baseline demographic variables is not applicable; Table 1 presents frequencies and proportions for descriptive purposes only. The duration of thyroid swelling ranged from 3 months to 8 years; 48.0% of patients reported a duration of 1–3 years before seeking surgical care. Preoperatively, 76.0% of patients were euthyroid, 14.0% were hypothyroid, and 10.0% were hyperthyroid. FNAC using Bethesda categorisation revealed that the majority (58.0%) were Bethesda II (benign). Table 1 summarises the demographic and preoperative clinical profile.

Table 1: Demographic and Preoperative Clinical Profile of Study Patients (n = 50) [1]

Variable	Category	n (%)	Mean ± SD / Median (IQR)	Note
Age (years)	—	—	38.7 ± 12.4	—
	< 30 years	12 (24.0)	—	—
	30–50 years	28 (56.0)	—	—
	> 50 years	10 (20.0)	—	—
Sex	Female	41 (82.0)	—	—
	Male	9 (18.0)		
Duration of swelling	< 1 year	18 (36.0)	—	—
	1–3 years	24 (48.0)		
	> 3 years	8 (16.0)		
Preoperative TFT	Euthyroid	38 (76.0)	—	—
	Hypothyroid	7 (14.0)		
	Hyperthyroid	5 (10.0)		
FNAC (Bethesda)	II (Benign)	29 (58.0)	—	—
	III (AUS/FLUS)	6 (12.0)		
	IV (FN/SFN)	5 (10.0)		

	V (Suspicious)	4 (8.0)		
	VI (Malignant)	6 (12.0)		
Goitre size (USG)	< 4 cm	21 (42.0)	—	—
	4–7 cm	19 (38.0)		
	> 7 cm	10 (20.0)		

Type of Surgery and Operative Details: The most common procedure performed was total thyroidectomy in 24 patients (48.0%), followed by near-total thyroidectomy in 10 (20.0%), hemithyroidectomy with isthmectomy in 9 (18.0%), completion thyroidectomy in 5 (10.0%), and subtotal thyroidectomy in 2 (4.0%) patients (Figure 1). The mean operative time for total thyroidectomy was 132.6 ± 24.3 minutes compared to 94.2 ± 18.7 minutes for hemithyroidectomy. The median hospital stay was 4 days (IQR: 3–6). There was no intraoperative mortality or intraoperative major vascular injury.

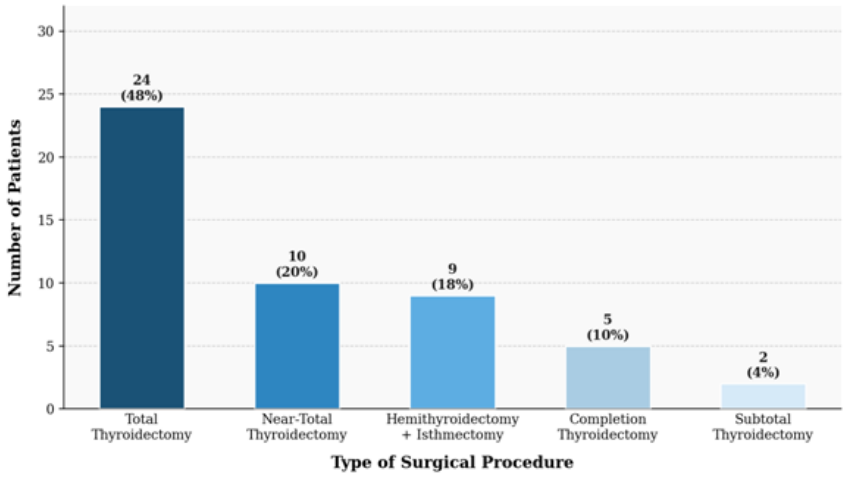

Figure 1: Distribution of Thyroidectomy Procedures Performed (n = 50)

Histopathological Findings: Histopathological analysis revealed that 29 patients (58.0%) had benign disease; multinodular goitre was the most common diagnosis (36.0%), followed by colloid goitre (10.0%), follicular adenoma (8.0%), and Hashimoto's thyroiditis (4.0%). Malignant histology was identified in 21 patients (42.0%); papillary thyroid carcinoma (PTC) accounted for 20.0% of all cases, representing the most frequent malignancy, followed by medullary thyroid carcinoma (MTC, 8.0%), follicular thyroid carcinoma (FTC, 6.0%), poorly differentiated thyroid carcinoma (PDTC, 6.0%), and Oncocytic (Hürthle cell) neoplasm (2.0%). It should be noted that Oncocytic neoplasms represent a pathological category requiring histological assessment of capsular and vascular invasion to distinguish benign from malignant behaviour; the single case in this series was classified as Oncocytic adenoma on final pathology. Table 2 presents the surgical and histopathological details. The concordance between preoperative FNAC Bethesda category and final histopathological diagnosis is presented in Table 4. Malignancy rates increased with ascending Bethesda category: 6.9% for Bethesda II, 66.7% for Bethesda III, 100.0% for Bethesda IV, V, and VI.

Table 4: FNAC Bethesda Category versus Final Histopathological Diagnosis – Concordance Analysis (n = 50)

Bethesda Category	Total FNAC n	Benign Histology n (%)	Malignant Histology n (%)	Malignancy Rate (%)
II (Benign)	29	27 (93.1%)	2 (6.9%)	6.9%
III (AUS/FLUS)	6	2 (33.3%)	4 (66.7%)	66.7%
IV (FN/SFN)	5	0 (0%)	5 (100.0%)	100.0%
V (Suspicious)	4	0 (0%)	4 (100.0%)	100.0%
VI (Malignant)	6	0 (0%)	6 (100.0%)	100.0%
Total	50	29 (58.0%)	21 (42.0%)	42.0%

AUS = Atypia of Undetermined Significance; FLUS = Follicular Lesion of Undetermined Significance; FN = Follicular Neoplasm; SFN = Suspicious for Follicular Neoplasm. Formal diagnostic accuracy indices (sensitivity, specificity, PPV, NPV) were not calculated as this was a descriptive concordance analysis.

Table 2: Surgical Procedures, Operative Details, and Histopathological Findings (n = 50)

Parameter	Category	n (%)	Histopathological Correlation
Type of Procedure	Total Thyroidectomy	24 (48.0)	12 malignant; 12 benign
	Near-Total Thyroidectomy	10 (20.0)	3 malignant; 7 benign
	Hemithyroidectomy + Isthmectomy	9 (18.0)	1 malignant; 8 benign
	Completion Thyroidectomy	5 (10.0)	5 malignant
	Subtotal Thyroidectomy	2 (4.0)	2 benign
Histopathological Diagnosis	Multinodular Goitre (MNG)	18 (36.0)	—
	Colloid Goitre	5 (10.0)	
	Follicular Adenoma	4 (8.0)	
	Papillary Thyroid Carcinoma	10 (20.0)	
	Follicular Thyroid Carcinoma	3 (6.0)	
	Hashimoto's Thyroiditis	2 (4.0)	
	Medullary Thyroid Carcinoma	4 (8.0)	
	Poorly Differentiated Thyroid Carcinoma	3 (6.0)	
	Oncocytic (Hürthle Cell) Neoplasm	1 (2.0)	
Operating Time (min)	Overall Mean ± SD	—	118.4 ± 28.6
	Total Thyroidectomy	—	132.6 ± 24.3
	Hemithyroidectomy + Isthmectomy	—	94.2 ± 18.7
Hospital Stay (days)	Median (IQR)	—	4 (3–6)

Postoperative Complications: The overall complication rate was 40.0% (n = 20 patients). Each patient was counted once based on their most clinically significant complication; patients with multiple complications are reported under their primary complication category. The most frequent complication was transient hypocalcaemia, occurring in 8 patients (16.0%), followed by transient RLN palsy in 4 patients (8.0%), wound infection in 3 (6.0%), permanent hypocalcaemia in 2 (4.0%), and permanent RLN palsy in 1 (2.0%). Patients with permanent hypocalcaemia had initially presented with transient hypocalcaemia that failed to resolve within 6 months and are reported as permanent cases only. Post-operative bleeding requiring surgical re-exploration occurred in 1 patient (2.0%) and seroma in 1 patient (2.0%). There was no perioperative mortality. Complication rates were significantly higher following total thyroidectomy (58.3%) compared to other procedures (23.1%; p = 0.011). Transient hypocalcaemia was significantly more frequent after total thyroidectomy than after other procedures (25.0% vs 7.7%; p = 0.042). Table 3 details the complication profile.

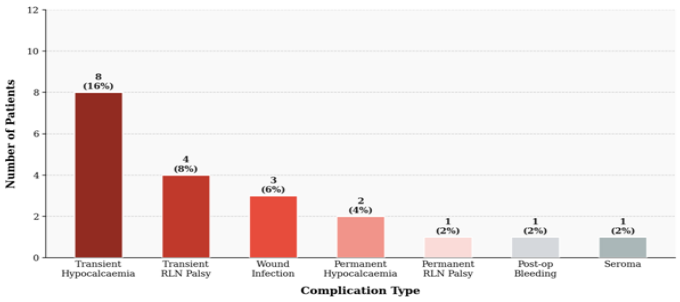

Figure 2: Postoperative Complication Profile Following Thyroidectomy (n = 50)

Table 3: Postoperative Complication Analysis Stratified by Type of Surgical Procedure (n = 50)

Complication	Total n (%)	After Total Thyroidectomy n (%)	After Other Procedures n (%)	p-value
Transient Hypocalcaemia	8 (16.0)	6 (25.0)	2 (7.7)	0.042
Transient RLN Palsy	4 (8.0)	3 (12.5)	1 (3.8)	0.196
Wound Infection	3 (6.0)	1 (4.2)	2 (7.7)	0.621
Permanent Hypocalcaemia	2 (4.0)	2 (8.3)	0 (0)	0.137
Permanent RLN Palsy	1 (2.0)	1 (4.2)	0 (0)	0.296
Post-operative Bleeding	1 (2.0)	1 (4.2)	0 (0)	0.296
Seroma	1 (2.0)	0 (0)	1 (3.8)	0.351
Overall Complication Rate	20 (40.0)	14 (58.3)	6 (23.1)	0.011

Discussion

This 36-month prospective audit from a dedicated cancer institute in eastern India provides a comprehensive institutional analysis of thyroidectomy outcomes in a resource-limited environment. The principal findings are that thyroid surgery can be undertaken with acceptable safety profiles, while reinforcing that total thyroidectomy remains associated with a significantly higher complication burden relative to more conservative resections, particularly in the absence of advanced intraoperative adjuncts.

The female predominance observed in our cohort (82.0%) is consistent with the established epidemiological pattern of thyroid disease, in which benign and malignant thyroid conditions disproportionately affect women, particularly during the reproductive decades. Similar sex distributions have been reported across institutional audits in India and South Asia.[8,9] The mean age of 38.7 years reflects the relatively younger demographic seen in thyroid disease in the Indian subcontinent compared to Western populations, where the median age at diagnosis of differentiated thyroid carcinoma tends to be higher.

Total thyroidectomy was performed in 48.0% of cases, reflecting the high proportion of bilateral pathology and malignant or indeterminate cytology (Bethesda III–VI) within our cohort. This is concordant with published institutional series from comparable oncology centres in India, where total thyroidectomy rates of 40–55% have been reported.[10] The proportion of malignant histology (42.0%) was notably higher than population-based estimates but characteristic of referral oncology centre data, where clinical suspicion thresholds for surgery are inherently higher. Papillary thyroid carcinoma constituted the dominant malignancy (20.0%), consistent with its universal epidemiological preponderance in differentiated thyroid cancer, followed by medullary thyroid carcinoma (8.0%), reflecting the institute's role as a dedicated cancer referral centre.

The overall complication rate of 40.0% in our series warrants contextualisation. Transient hypocalcaemia (16.0%) was the leading complication, a finding mirrored in published audits from LMICs. Khairy et al. reported transient hypocalcaemia rates of 18.4% following total thyroidectomy in an Egyptian tertiary centre.[11] Similarly, Slieker and Dobbins documented rates of 15–20% in resource-limited African settings.[12] The mechanism predominantly involves transient parathyroid dysfunction from gland manipulation or ischaemia, and the absence of routine intraoperative PTH measurement—unavailable in our setting—limits real-time identification of parathyroid compromise.

Transient RLN palsy was observed in 8.0% of patients overall, with a higher rate of 12.5% following total thyroidectomy. These figures are within the range reported from comparable low-resource settings. Musholt and colleagues highlighted that routine intraoperative nerve monitoring (IONM) reduces transient RLN injury rates, particularly in re-operative and malignant cases.[13] The absence of continuous IONM in our series likely contributes to observed rates; nonetheless, meticulous anatomical dissection under loupe magnification and use of a handheld nerve stimulator constituted the standard of care. Permanent RLN palsy (2.0%) compares favourably with published rates of 1–5% from comparable institutional audits and underscores the importance of disciplined dissection technique even without electrophysiological monitoring.

The complication rate following total thyroidectomy (58.3%) was significantly higher than after other procedures (23.1%; $p = 0.011$). This has been consistently documented internationally. Bergenfelz et al., in a large multicentre European prospective audit, identified total thyroidectomy as an independent predictor of both temporary and permanent hypoparathyroidism.[14] In a more recent systematic review, Bhargav and colleagues found that in Indian thyroid surgery series, total thyroidectomy carried a complication rate approximately 2.3 times that of hemithyroidectomy.[15] These findings collectively reinforce the importance of patient-specific surgical planning and restricting total thyroidectomy to appropriate indications.

The median hospital stay of 4 days (IQR: 3–6) is longer than the 1–2-day discharge practice prevalent in high-income countries but contextually appropriate given the need to monitor for delayed hypocalcaemia in the absence of rapid PTH assays, geographical barriers to re-admission, and the predominance of patients from rural areas with limited access to tertiary follow-up.[16] Wound infection (6.0%) and seroma (2.0%) rates are comparable with published series from similar settings. Contributing factors in this resource-limited context may include reduced availability of dedicated wound care nursing, limited antibiotic stewardship infrastructure, and the nutritional status of the predominantly rural patient population, though these associations are speculative in the absence of data.

Post-operative bleeding requiring re-exploration occurred in 2.0% of patients, consistent with published figures of 1–3% from both high-income

and LMIC settings.[17] All such cases were managed successfully without mortality, attesting to the adequacy of immediate surgical infrastructure at the institute.

The concordance between FNAC Bethesda category and final histopathology is presented in Table 4. Malignancy rates rose with ascending Bethesda category (from 6.9% in Bethesda II to 100.0% in Bethesda V and VI), consistent with published Bethesda System performance data. Formal diagnostic accuracy indices (sensitivity, specificity, PPV, NPV) were not computed, representing a limitation of this descriptive audit. False-negative rates of cytology for malignancy remain a recognised limitation of FNAC, particularly in follicular lesions and Oncocytic (Hürthle cell) neoplasms, where architectural features rather than cytological atypia determine malignant behaviour.[18] The absence of perioperative mortality in our series is a significant outcome. Several national and international institutional audits from similar settings have reported mortality rates of 0–0.5%, with major causes being airway emergency and haemorrhage.[19] The availability of a dedicated anaesthesia team experienced in head and neck cases and a functional intensive care facility at AHPGIC likely contributed to this outcome. Our study has several limitations that deserve acknowledgement. The sample size, while sufficient for a pilot audit, limits statistical power for multivariable analysis; the observed association between total thyroidectomy and higher complication rates should therefore be interpreted as hypothesis-generating rather than as evidence of independent causation, given that confounders such as malignancy, gland size, and re-operative surgery were not adjusted for. The absence of routine intraoperative PTH measurement and continuous IONM precludes comparison with centres where these are standard. Long-term oncological outcomes such as disease-free survival were not captured within the study window. Notwithstanding these limitations, the prospective design, standardised data collection, and inclusion of all consecutive cases minimise selection bias and strengthen the reliability of reported outcomes.

Conclusion

This 36-month institutional audit suggests that thyroidectomy can be performed with clinically acceptable outcomes at a resource-limited tertiary cancer centre in eastern India, with no perioperative mortality and complication profiles broadly comparable to published benchmarks from similar settings, though the modest sample size and absence of multivariable adjustment limit the generalisability of these findings. Total thyroidectomy was associated with significantly higher complication rates, predominantly transient hypocalcaemia and transient RLN palsy, underscoring the continued need for stringent case selection and meticulous technique.

The predominance of malignant and indeterminate cytology in the operative cohort reflects the referral pattern of a dedicated oncology institute. Systematic perioperative audits, structured follow-up protocols, stepwise introduction of intraoperative monitoring technologies, and ongoing surgeon training are essential levers for improving surgical outcomes in comparable resource-constrained environments. The findings of this study contribute to the growing regional evidence base and provide a reference point for future prospective multi-centre studies from similar LMIC settings.

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