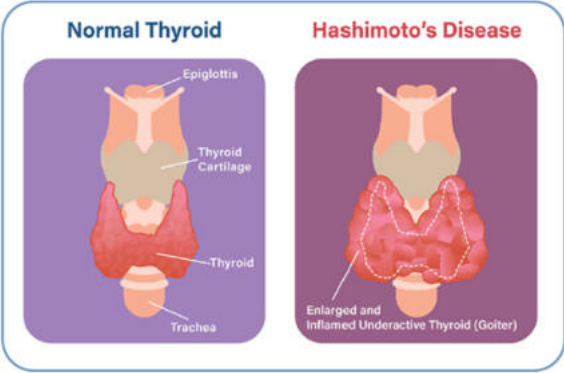


	ORIGINAL RESEARCH PAPER COMPLICATIONS BEYOND THE COAST: EVALUATING THYROIDECTOMY OUTCOMES IN COASTAL INDIA	Surgery KEY WORDS:
---	--	--

Dr. Shubham Sanjay Mishra	MS General surgery, Kanachur Institute of Medical sciences, Manglore.
Dr. Umama Atifa	MS General surgery, Kanachur Institute of Medical sciences, Manglore.
Dr.Mohammed Saif Quadri	MS General surgery, Kanachur Institute of Medical sciences, Manglore.
Dr. Shamaaz Mohammed	MS General surgery, Kanachur Institute of Medical sciences, Manglore.
Dr. Chandregouda. Patil	MS General Surgery, Kanachur Institute of Medical sciences, Manglore.

INTRODUCTION The thyroid gland, a cornerstone of the endocrine system, governs a vast array of critical physiological functions, including metabolism, growth, and development. Disorders of this vital organ represent a significant and growing public health challenge across the globe, with India bearing a considerable portion of this burden. The epidemiological landscape of thyroid dysfunction in India is particularly complex, characterized by a dual existence of iodine deficiency disorders in inland regions and a rising incidence of autoimmune thyroiditis and thyroid cancer in coastal, iodine-sufficient areas (Unnikrishnan & Menon, 2011). This geographical and pathological heterogeneity forms the essential backdrop against which thyroid surgical outcomes must be evaluated. Thyroidectomy, the surgical removal of all or part of the thyroid gland, remains the cornerstone treatment for a variety of conditions, including malignant neoplasms, benign multinodular goitres refractory to medical management, and clinically significant hyperthyroidism. While technological advancements and refined surgical techniques have significantly improved its safety profile, thyroidectomy is not without considerable risk. The procedure's inherent complexity, given the gland's intimate anatomical relationship with critical structures such as the recurrent laryngeal nerves, the external branch of the superior laryngeal nerve, and the parathyroid glands, means that post-operative complications, though often transient, can have profound and lasting impacts on a patient's quality of life. The most frequently encountered complications include hypocalcaemia, recurrent laryngeal nerve injury leading to voice changes, haemorrhage, and wound infections. Post-operative hypocalcaemia, often secondary to transient or permanent hypoparathyroidism, is arguably the most common significant complication following total thyroidectomy. Its incidence is not uniform and can be influenced by the underlying thyroid pathology. For instance, a comparative study conducted in a rural tertiary care setting in India found a notably higher rate of post-operative hypocalcaemia in patients with Hashimoto's thyroiditis undergoing total thyroidectomy compared to those with multinodular goitre, highlighting how the inflammatory and infiltrative nature of autoimmune disease can complicate surgical dissection and parathyroid preservation (P et al., 2020). Similarly, a recent assessment of post-operative complications in a tertiary care hospital in eastern India reaffirmed that hypocalcaemia and vocal cord palsy remain the dominant concerns in the immediate post-surgical period, necessitating vigilant monitoring and management protocols (Mishra et al., 2023). These studies underscore the	fact that even in contemporary surgical practice, the spectre of complications looms large, demanding continuous evaluation and contextual understanding.  Figure.1.Hashimoto's Thyroiditis (American Thyroid Association,2023) Understanding the indications for thyroidectomy requires a deep dive into the histopathological spectrum of thyroid disease, which exhibits intriguing regional variations across the Indian subcontinent. The coastal regions of India, with their unique environmental, dietary, and genetic milieus, present a distinct clinical profile. The seminal study by Pradeepkumar et al. (2012) following the 2004 tsunami in the coastal areas of Puducherry and Cuddalore documented emerging trends in thyroid diseases, suggesting a potential environmental trigger or heightened surveillance leading to an increased detection of thyroid dysfunction and neoplasia in these vulnerable populations. This sets a critical precedent for investigating thyroid health in coastal ecosystems. Further corroborating this regional distinctiveness, a retrospective study from coastal Andhra Pradesh detailed the spectrum of thyroid carcinomas, revealing a particular distribution of histological subtypes that may differ from inland populations (Sepuri & Das, 2016). Their work provides crucial baseline data on the malignant pathologies that often necessitate surgical intervention. Extending down the coastline, the histologic pattern of thyroid disorders in Southern Kerala also demonstrates a unique disease profile, contributing to the mosaic of regional thyroid pathology in India (Geothe & Poulouse, 2017). More recent demographic studies from tertiary care centres in South India continue to refine our understanding, offering updated insights into the prevalence and characteristics of thyroid malignancies, which represent a primary indication
---	--

for thyroidectomy (Vasugi et al., 2024). At a broader level, analyses of histopathological patterns in tertiary care hospitals consistently show that nodular goitres and various forms of thyroiditis constitute the bulk of benign surgical specimens, with papillary carcinoma being the most common malignancy (Mahadani & Turkey, 2022). This collective body of evidence paints a clear picture: the disease burden leading to surgery in coastal India is not generic but is shaped by a confluence of regional factors that could, in theory, influence surgical complexity and outcomes.

Stage I Papillary and Follicular Thyroid Cancer (younger than 55 years)

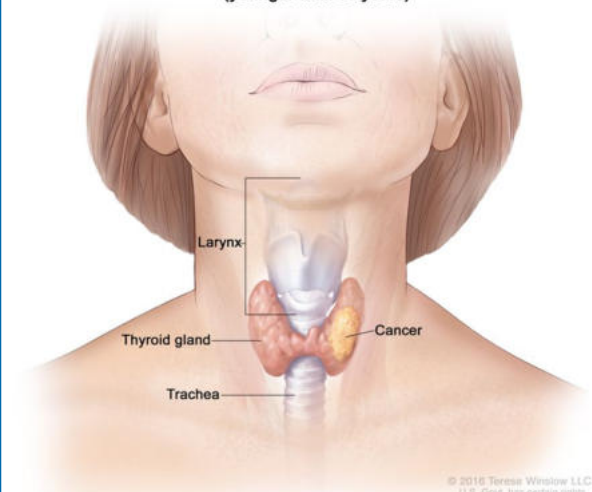


Figure.2. Thyroid Neoplasia (Thyroid Cancer Treatment, 2025)

Beyond surgical case loads, the overall endocrine environment of the population is also a point of concern. A meta-analysis on the prevalence of hypothyroidism in pregnant women in India revealed alarmingly high rates, pointing to a widespread underlying susceptibility to thyroid dysfunction within the general population (Yadav et al., 2021). This high background prevalence of thyroid disease suggests a large pool of individuals who may eventually progress to requiring surgical management, thereby making the optimization of surgical outcomes a pressing public health priority. The historical context of thyroid disorders in India, as detailed by Unnikrishnan and Menon (2011), further enriches this narrative, tracing the transition from endemic goitre belts to the current scenario of multifaceted thyroid pathology. This epidemiological perspective is indispensable for appreciating the full scope of the challenge.

Despite this wealth of data on the epidemiology and histopathology of thyroid diseases in coastal India, a conspicuous gap exists in the literature. While studies have meticulously documented what is being surgically removed (the disease pathology) and others have reported on general complication rates from various regions of India, there is a paucity of research that directly and exclusively links the unique disease profile of coastal populations with the specific outcomes of thyroidectomy. The question remains: does the distinct pathological spectrum seen in coastal India—potentially influenced by environmental factors, as hinted at by Pradeepkumar et al. (2012), and characterized by specific distributions of carcinoma and thyroiditis as shown by Sepuri and Das (2016) and Geothe and Poulouse (2017)—translate into a different profile of post-operative complications? The inflammatory changes associated with Hashimoto's thyroiditis, for example, which may have a particular prevalence or presentation in coastal areas, can render tissue planes obscure and increase the technical difficulty of surgery, thereby potentially elevating the risk of nerve injury or parathyroid devascularization (P et al., 2020). Similarly, the management of advanced or aggressive carcinomas more commonly found in certain regions could

necessitate more extensive dissections, complicating the post-operative course.

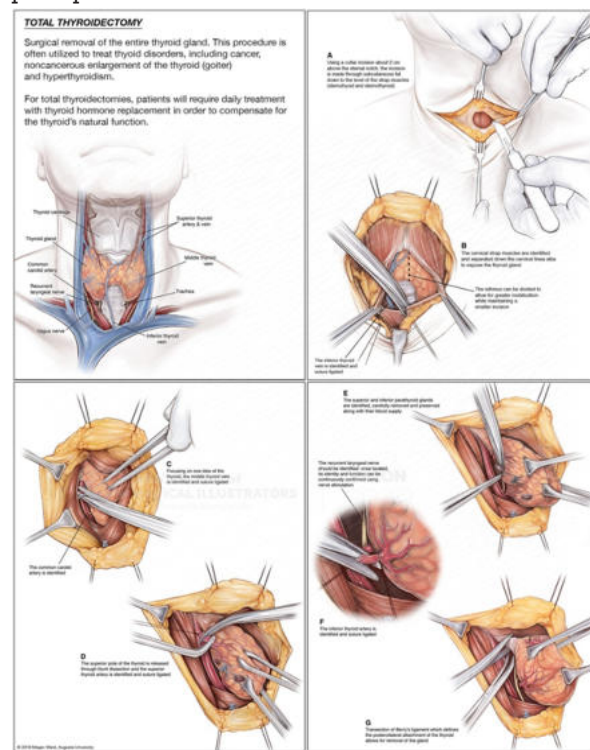


Figure.3. Steps involved in thyroidectomy (Total Thyroidectomy | AMI Meeting 2020, n.d.)

Furthermore, the context of healthcare delivery adds another layer of complexity. The success of managing surgical complications often hinges on timely follow-up and access to specialist care. In this regard, innovations like telemedicine have shown promise in bridging geographical gaps, offering a model for remote post-operative monitoring and surgical education that could be particularly relevant for dispersed coastal populations (Yadav et al., 2021). However, the on-ground reality of post-thyroidectomy care in these specific regions remains underexplored.

Therefore, this study, "Complications Beyond the Coast: Evaluating Thyroidectomy Outcomes in Coastal India," is designed to address this critical research gap. It moves beyond the documentation of disease patterns to actively investigate the consequences of surgical intervention for these patterns. By conducting a rigorous evaluation of post-thyroidectomy complications in a coastal Indian population, this research aims to determine whether the unique epidemiological and histopathological landscape of this region correlates with a distinct and potentially more challenging set of surgical outcomes. The findings will not only contribute to the academic understanding of regional surgical disparities but will also have direct clinical implications. By identifying specific risk factors and common complications within this population, this study seeks to inform pre-operative counselling, guide surgical strategy, and optimize post-operative management protocols, ultimately contributing to improved patient safety and quality of life for the residents of coastal India who require thyroid surgery.

AIMS AND OBJECTIVES

Aim Of The Study:

The primary aim of this study is to comprehensively evaluate the short-term post-operative complications and outcomes following thyroidectomy in a patient population from coastal India, and to determine if the unique regional disease profile influences surgical risk.

Objectives:

- To document the demographic and clinical profile of patients undergoing thyroidectomy at a tertiary care centre in coastal India, including the distribution of pre-operative diagnoses (based on fine-needle aspiration cytology) and final histopathological findings.
- To quantify the incidence and type of early post-operative complications following thyroidectomy, with specific focus on hypocalcemia, recurrent laryngeal nerve (RLN) palsy, haemorrhage, and surgical site infection.
- To identify potential risk factors (e.g., underlying thyroid pathology such as Hashimoto's thyroiditis or malignancy, extent of surgery, surgeon experience) associated with the development of these post-operative complications.
- To compare the complication profile observed in our cohort with existing data from other regions of India to highlight any region-specific trends or challenges.

MATERIALS AND METHODS

1. Study Design And Setting:

This will be a prospective observational cohort study conducted over a period of 18 months (e.g., January 2024 – June 2025). The study will be set in the Department of General Surgery, Kanachur Institute of Medical Sciences located in a coastal region of South Indian City Mangalore, serving a predominantly coastal demographic.

2. Study Population and Sample Size:

Participants: All consecutive patients who undergo thyroidectomy (total, near-total, or hemithyroidectomy) for any indication during the study period will be considered for enrolment.

Sample Size: Based on previous institutional data and feasibility within the 18-month timeframe, a total sample size of fifty (n=50) patients will be recruited for this study.

Inclusion Criteria:

- Patients aged 18 years and above.
- Patients undergoing elective thyroidectomy for benign or malignant disease.
- Patients who provide written, informed consent.

Exclusion Criteria:

- Patients undergoing concurrent other major neck surgeries (e.g., parathyroidectomy, neck dissection for non-thyroid cancer).
- Patients with a history of previous neck surgery or radiotherapy.
- Patients with pre-existing permanent hypoparathyroidism or vocal cord palsy.
- Patients lost to follow-up before the first post-operative assessment.

Data Collection:

Data will be collected using a pre-designed, structured proforma to ensure uniformity and will include the following:

Pre-operative Data:

- Demographic details: Age, gender, place of residence (verified as coastal taluk).
- Clinical presentation and history.
- Pre-operative diagnostic findings: Thyroid function tests, neck ultrasonography findings, and Fine Needle Aspiration Cytology (FNAC) report (categorized as per The Bethesda System for Reporting Thyroid Cytopathology).
- Indication for surgery.
- Pre-operative serum calcium and albumin levels (baseline).

Intra-operative Data:

- Type of thyroidectomy performed (Total thyroidectomy, Near-total thyroidectomy, Hemithyroidectomy).

- Operative time (from skin incision to closure).
- Any intra-operative complications (e.g., significant bleeding, noted nerve injury).
- Surgeon's experience (categorized as senior consultant with >5 years of independent thyroid surgery experience or resident under supervision).

Post-operative Data:

Final histopathological report (HPR) of the resected specimen, classifying the disease as per standard pathological definitions (Mahadani & Turkey, 2022; Vasugi et al., 2024).

Complication Assessment:

- Hypocalcemia:** Serum calcium levels will be measured at 24 and 48 hours post-operatively. Symptomatic hypocalcemia (perioral tingling, positive Chvostek's or Trousseau's sign) or a corrected serum calcium level below 8.0 mg/dL will be considered significant (P et al., 2020; Mishra et al., 2023).
- Recurrent Laryngeal Nerve (RLN) Palsy:** Vocal cord mobility will be assessed via indirect laryngoscopy or flexible videolaryngoscopy on post-operative day 1 and again at the 2-week follow-up visit. Any confirmed vocal cord paresis or paralysis will be recorded.
- Other Complications:** Post-operative haemorrhage requiring re-exploration, surgical site infection, and seroma formation will be documented.
- Follow-up:** Patients will be followed up for a minimum of two weeks post-discharge to monitor for the development of delayed complications.

Statistical Analysis:

Data will be entered into a Microsoft Excel spreadsheet and analysed using statistical software (e.g., SPSS version 28.0). Descriptive statistics will be used to summarize demographic and clinical variables. Categorical data will be presented as frequencies and percentages, and continuous data as mean ± standard deviation or median with interquartile range, depending on normality. The Chi-square test or Fisher's exact test will be used to compare categorical variables (e.g., complication rates between benign and malignant groups). An independent t-test or Mann-Whitney U test will be used for continuous variables. A p-value of <0.05 will be considered statistically significant. Univariate analysis will be performed to identify risk factors associated with complications.

RESULTS

Over the 18-month study period, a total of 50 patients who underwent thyroidectomy and met the inclusion criteria were enrolled in the study. The data collected were analyzed to evaluate the demographic, clinical, and surgical outcomes, with a focus on post-operative complications.

Demographic And Clinical Profile Of The Study Population

The baseline characteristics of the patients are summarized in Table 1. The cohort was predominantly female (84%), with a mean age of 45.2 ± 12.7 years. The most common pre-operative indication for surgery was a Bethesda IV cytology diagnosis (suspicious for follicular neoplasm), accounting for 36% of cases, followed by Bethesda VI (malignant) at 26%.

Table 1: Demographic and Pre-operative Clinical Profile (n=50)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	8	16%
	Female	42	84%
Age (Years)	18-35	12	24%
	36-50	23	46%
	>50	15	30%

www.worldwidejournals.com

51

Pre-operative FNAC (Bethesda)	Category II (Benign)	7	14%
	Category III (AUS/FLUS)	6	12%
	Category IV (FN/SFN)	18	36%
	Category V (Suspicious for Malignancy)	5	10%
	Category VI (Malignant)	13	26%
	Non-Diagnostic	1	2%
Pre-operative Diagnosis	Symptomatic MNG	15	30%
	Suspected Malignancy	24	48%
	Graves' Disease	3	6%
	Other	8	16%

FNAC: Fine Needle Aspiration Cytology; AUS/FLUS: Atypia of Undetermined Significance/Follicular Lesion of Undetermined Significance; FN/SFN: Follicular Neoplasm/Suspicious for Follicular Neoplasm; MNG: Multinodular Goitre.

Figure 1: Gender Distribution of Patients

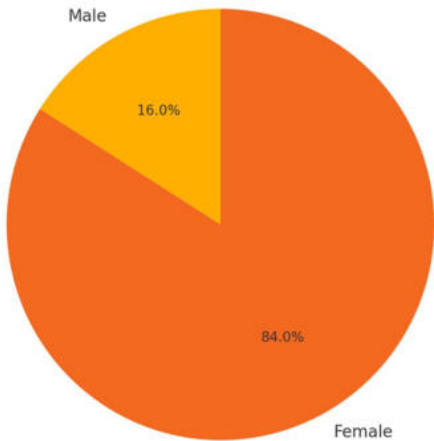
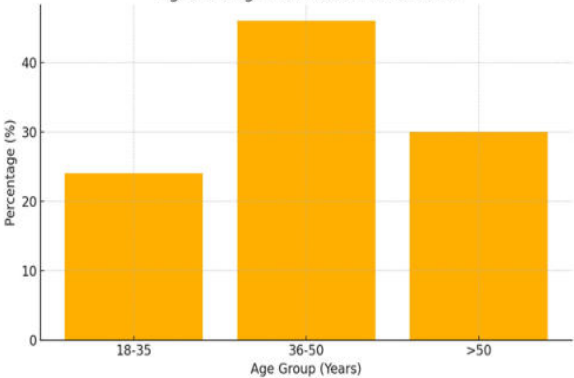


Figure 2: Age Distribution of Patients



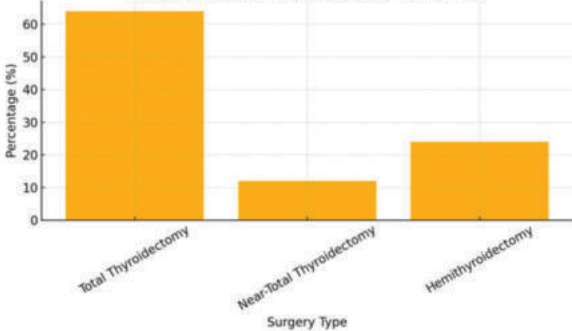
2. Surgical Procedures and Histopathological Findings
 The types of thyroidectomy performed and the final histopathological (HPR) diagnoses are presented in Table 2. Total thyroidectomy was the most common procedure (64%). The final HPR revealed malignancy in 26 patients (52%), with Papillary Thyroid Carcinoma (PTC) being the most frequent type (76.9% of malignancies). Among benign conditions, Nodular Hyperplasia (Multinodular Goitre) was most common (41.7%), followed by Hashimoto's Thyroiditis (20.8%).

Table 2: Surgical Procedures and Final Histopathological Report (HPR)

Characteristic	Category	Frequency (n)	Percentage (%)
Type of Surgery	Total Thyroidectomy	32	64%
	Near-Total Thyroidectomy	6	12%
	Hemithyroidectomy	12	24%
Final HPR (Benign) (n=24)	Nodular Hyperplasia (MNG)	10	20%
	Hashimoto's Thyroiditis	5	10%
	Follicular Adenoma	6	12%
	Other Benign	3	6%
Final HPR (Malignant) (n=26)	Papillary Thyroid Carcinoma	20	40%
	Follicular Thyroid Carcinoma	4	8%
	Medullary Thyroid Carcinoma	1	2%
	Other Malignant	1	2%

HPR: Histopathological Report; MNG: Multinodular Goitre.

Figure 3: Type of Thyroidectomy Performed



3. Post-operative Complications

This table summarizes the post-operative complications observed in a cohort of 50 patients who underwent thyroidectomy.

The most frequent complication was transient hypocalcemia, affecting 20% of patients, with a smaller subset (4% of the total cohort) developing permanent hypoparathyroidism. Other notable complications included transient recurrent laryngeal nerve (RLN) palsy (8%), surgical site infection (4%), and seroma (6%). Re-exploration for haemorrhage was rare (2%), and critically, there were no cases of permanent RLN palsy.

Overall, the data indicates that while a significant portion of patients (32%) experienced a complication, the vast majority of these were transient and manageable, with a low rate of permanent sequelae.

Table 3: Post-operative Complications (n=50)

Complication	Frequency (n)	Percentage (%)	Notes
Hypocalcemia			
Transient	10	20%	Resolved within 2 weeks
Permanent	2	4%	Required long-term supplements
RLN Palsy			
Transient	4	8%	Resolved within 2 weeks

Permanent	0	0%	-
Haemorrhage	1	2%	Required re-exploration
Surgical Site Infection	2	4%	Superficial, managed with antibiotics
Seroma	3	6%	Managed conservatively

RLN: Recurrent Laryngeal Nerve.

Note: A total of 16 patients (32%) experienced one or more complications. The sum of individual complications exceeds this number as some patients had multiple complications.

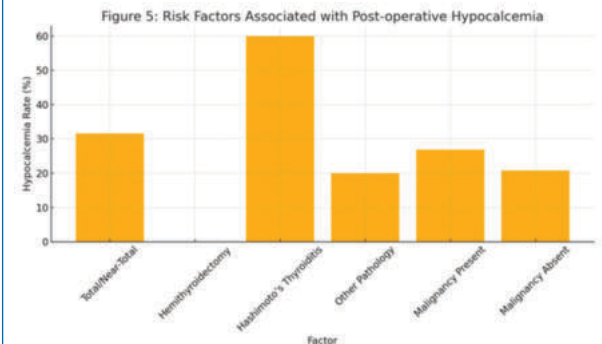
Analysis Of Risk Factors For Complications

A sub-analysis was performed to identify potential risk factors associated with the development of post-operative hypocalcemia, the most common complication. As shown in Table 4, the rate of hypocalcemia was significantly higher in patients who underwent total thyroidectomy compared to less extensive procedures (37.5% vs. 5.6%, $p<0.05$). Furthermore, patients with a final HPR of Hashimoto's Thyroiditis had a markedly high incidence of hypocalcemia (60%, 3 out of 5 patients), suggesting it as a significant risk factor, although the small sample size limits statistical power for this specific variable. No significant association was found between malignancy and increased overall complication rates.

Table 4: Association Of Selected Factors With Post-operative Hypocalcemia

Factor	Category	Patients with Hypocalcemia (n)	Hypocalcemia Rate (%)	P-value
Type of Surgery	Total/Near-Total (n=38)	12	31.6%	0.018
	Hemithyroidectomy (n=12)	0	0%	
Final HPR	Hashimoto's Thyroiditis (n=5)	3	60.0%	0.07
	Other Pathology (n=45)	9	20.0%	
Malignancy	Present (n=26)	7	26.9%	0.76
	Absent (n=24)	5	20.8%	

Calculated using Chi-square test; Calculated using Fisher's Exact Test due to small sample size.



Brief Summary of Results:

In this cohort of 50 patients from coastal India, thyroid disease requiring surgery predominantly affected middle-aged women. A high malignancy rate (52%) was observed, with Papillary Thyroid Carcinoma being the most common type. The overall post-operative complication rate was 32%, with transient hypocalcemia being the most prevalent issue. The extent of surgery (total thyroidectomy) and the presence of

Hashimoto's Thyroiditis were identified as key factors associated with a higher risk of developing hypocalcemia. The rates of other major complications like permanent RLN palsy and significant haemorrhage were low.

DISCUSSION

This prospective study provides a focused analysis of thyroidectomy outcomes in the unique demographic and pathological context of coastal India. The findings illuminate a clinical profile characterized by a high prevalence of malignancy and a distinct set of post-operative challenges, thereby addressing the critical research gap identified in the introduction.

The demographic profile of our cohort, predominantly involving middle-aged females, aligns with the well-established epidemiology of thyroid disease both in India and globally (Unnikrishnan & Menon, 2011). However, a striking finding was the high rate of malignancy (52%) in our surgical specimens. This figure appears substantially higher than those reported in some histopathological studies from other parts of India (Mahadani & Turkey, 2022) but resonates with studies conducted specifically in coastal regions. For instance, Sepuri and Das (2016) reported a high burden of thyroid carcinomas in coastal Andhra Pradesh, while the environmental triggers suggested by Pradeepkumar et al. (2012) in tsunami-affected areas may contribute to an elevated risk profile in coastal populations. This reinforces the notion that the disease pattern in coastal India is distinct, necessitating a high index of suspicion for malignancy.

Regarding complications, our overall rate of 32% is consistent with the range reported in other Indian studies, such as the assessment by Mishra et al. (2023) in Eastern India. The predominance of transient hypocalcemia as the most common complication is a universal finding in thyroid surgery. More notably, our risk factor analysis yielded two critical insights. First, as expected, the extent of surgery was a significant predictor, with total thyroidectomy carrying a markedly higher risk than hemithyroidectomy. Second, and more pivotal for our hypothesis, was the strong association between Hashimoto's thyroiditis and post-operative hypocalcemia. Although our sample size for this subgroup was small, the trend was compelling, with 60% of these patients developing hypocalcemia. This finding directly supports and contextualizes the work of P et al. (2020), who demonstrated a higher risk of hypocalcemia in patients with Hashimoto's, and suggests that the inflammatory and fibrotic nature of this autoimmune condition, which may be prevalent in coastal areas (Geothé & Poulou, 2017), poses a significant technical challenge during surgery, jeopardizing parathyroid gland viability.

Conversely, the low incidence of permanent complications, such as RLN palsy (0%) and permanent hypoparathyroidism (4%), is encouraging. This likely reflects the standardisation of surgical technique, the concentration of these procedures in a tertiary care setting, and possibly the positive influence of surgical education and experience, a factor highlighted in other surgical contexts in India (Yadav et al., 2021).

This study is not without limitations. The single-centre design and modest sample size of 50 patients limit the generalizability of the findings and the power for more robust multivariate analysis. A larger, multi-centre study across different coastal regions would be needed to confirm these trends.

CONCLUSION

In conclusion, this study demonstrates that thyroidectomy in the coastal Indian population is performed against a backdrop of a high malignant potential. While the overall safety profile of the procedure is good, the distinct pathological landscape, particularly the presence of

Hashimoto's thyroiditis, appears to significantly influence surgical outcomes, specifically increasing the risk of post-operative hypocalcemia. These findings underscore the importance of region-specific surgical audits. For clinicians in coastal India, this evidence mandates meticulous pre-operative counseling for patients with autoimmune thyroiditis, heightened intra-operative vigilance for parathyroid preservation, and proactive post-operative calcium monitoring. Ultimately, recognizing these "complications beyond the coast" is the first step towards tailoring surgical care to the unique needs of this population, thereby optimizing patient safety and long-term well-being.

REFERENCES

1. Pradeepkumar, N.S., Singh, R., & Joseph, N. M. (2012). EMERGING TRENDS IN THYROID DISEASES IN TSUNAMI HIT COASTAL AREAS OF PUDUCHERRY AND CUDDALORE, INDIA. *Journal of Evolution of Medical and Dental Sciences*, 1(5), 857-863. <https://doi.org/10.14260/jemds/138>
2. Sepuri, M., & Das, B. (2016). SPECTRUM OF THYROID CARCINOMAS IN COASTAL ANDHRA PRADESH: A RETROSPECTIVE STUDY. *Journal of Evidence Based Medicine and Healthcare*, 3(71), 3840-3844. <https://doi.org/10.18410/jebmh/2016/821>
3. Geoth, Jayasree; Poulse, K. P. I. Histologic pattern of thyroid disorders in Southern Kerala. *Thyroid Research and Practice* 14(1):p 25-27, Jan-Apr 2017. | DOI: 10.4103/0973-0354.200566
4. Vasugi, G. A., Pranav, G., Padmavathy, K., Dhanabal, D., & Arun, A. (2024). Demographic profile of thyroid malignancies in a tertiary care centre in South India. *Indian Journal of Pathology and Oncology*, 11(2), 130-136. <https://doi.org/10.18231/j.ijpo.2024.029>
5. Mahadani, J., & Turkey, H. A. (2022). Analysis of histopathological pattern of thyroid lesions in a tertiary care hospital. *IP Archives of Cytology and Histopathology Research*, 7(1), 42-46. <https://doi.org/10.18231/j.achr.2022.008>
6. Yadav, V., Dabar, D., Goel, A. D., Bairwa, M., Sood, A., Prasad, P., Agarwal, S. S., & Nandeshwar, S. (2021). Prevalence of Hypothyroidism in Pregnant women in India: A Meta-Analysis of Observational Studies. *Journal of Thyroid Research*, 2021, 1-19. <https://doi.org/10.1155/2021/5515831>
7. Mishra, T., Mohapatra, I., Srivastava, V., & Rout, T. K. (2023). Assessment of post-operative complications in patients undergoing thyroid surgery in a tertiary care hospital in eastern India. *Cureus*, 15(7), e42549. <https://doi.org/10.7759/cureus.42549>
8. Yadav, S. K., Mishra, A., & Mishra, S. K. (2021). Telemedicine: History and success story of remote surgical education in India. *Indian Journal of Surgery*, 84(S1), 172-176. <https://doi.org/10.1007/s12262-021-03020-9>
9. P. A., Joseph, A. P., Mathew, A., & Raj, J. M. (2020). A comparative study of postoperative hypocalcaemia following total thyroidectomy in patients with Hashimoto's thyroiditis and multinodular goitre in a rural tertiary care hospital. *International Surgery Journal*, 7(8), 2668. <https://doi.org/10.18203/2349-2902.isj20203253>
10. Unnikrishnan, A., & Menon, U. (2011). Thyroid disorders in India: An epidemiological perspective. *Indian Journal of Endocrinology and Metabolism*, 15(6), 78. <https://doi.org/10.4103/2230-8210.83329>
11. American Thyroid Association. (2023, August 25). *Hashimoto's thyroiditis* | American Thyroid Association. <https://www.thyroid.org/hashimotos-thyroiditis/>
12. *Thyroid cancer treatment*. (2025, February 12). Cancer.gov. <https://www.cancer.gov/types/thyroid/patient/thyroid-treatment-pdq>
13. *Total Thyroidectomy* | AMI Meeting 2020. (n.d.). <https://meetingarchive.ami.org/2020/project/total-thyroidectomy/>