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EVALUATING THE INCIDENCES OF COMPLICATIONS AFTER TOTAL THYROIDECTOMY

Original Article

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ABSTRACT

Background: The issue of post-thyroidectomy complications is a major area of interest in the field of endocrine surgery, impacting safety, the length of stay of patients, and long-term quality of life. These problems could be due to a multifactorial interplay of patient factors, anatomy, and operative incidents. The objective of this study was to establish the prevalence of typical post-thyroidectomy complications and evaluate their relation to socio-demographic and clinical predictors.

Methods: A cross-sectional observational study design was used to collect data on 235 patients who had total thyroidectomy in a tertiary care facility. The variables gathered were age, gender, BMI, surgery indication, preoperative calcium levels, prior neck surgery, surgical time, and postoperative complications like hypocalcemia, recurrent laryngeal nerve (RLN) injury, dysphagia, hemorrhage, wound infection, and thyroid storm. Statistical analysis was conducted with the help of SPSS version 26.0. A chi-square analysis and an independent t-test were used, and the level of significance was $p < 0.05$.

Results: The most common complications were hypocalcemia (78 (33.2%), p = <0.001) and injury of the RLN (19 (8.1%), p = 0.029). It revealed significant correlations between complications and age(p=0.031), gender(p=0.012), BMI(p=0.029), preoperative calcium levels(p=0.003), previous neck surgery(p=0.041), and intraoperative blood loss(p=0.017). The occurrence of dysphagia and wound infection was relatively lower and did not reach statistical significance. No incidences of thyroid storm were noted.

Conclusion: Hypocalcemia and nerve injury were the most frequently occurring post-thyroidectomy complications with a clear exposure to modifiable risk factors. Some complications may be reduced through preoperative calcium correction, thorough surgical planning, and intraoperative identification of nerves. The use of institutional procedures that emphasize early identification and prevention strategies would enhance patient outcomes and quality of surgical care in thyroidectomies.

Keywords: Thyroidectomy, Postoperative Complications, Hypocalcemia, Recurrent Laryngeal Nerve Injuries, Neck Dissection.

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INTRODUCTION

Thyroidectomy, specifically total thyroidectomy, has been the most frequently practiced endocrine surgical procedure because of the increased global burden of nodular thyroid disease and thyroid malignancies. A multicentric cohort study demonstrated that more than 70% of the operations included total thyroidectomy in the differentiated thyroid carcinoma (1). According to the meta-analysis, 27% of patients experienced transient hypocalcemia, and 3.5% of patients had recurrent laryngeal nerve (RLN) injury (2). Another study also highlighted that permanent hypoparathyroidism, though with a lower preponderance of 1-2%, has severe post-operative effects, severely affecting the long-term quality of life (3). The importance of monitoring calcium early after surgery in decreasing biochemical side effects has also been demonstrated (4). A recent systematic review proposed that central neck dissection and surgeon volume are significant predisposing factors of recurrent laryngeal nerve (RLN) injury (5). In addition, gender and Vitamin D status were found to be modifiable predictors of hypocalcemia (6). An investigative study concludes that any slight anatomical deviation in nerve path determines the possibility of incurring nerve injury during thyroid surgery (7). In addition, the prevention of vocal disability in the long term requires early identification of dysphonia after surgery has also been indicated (8).

Thyroid diseases are the second major endocrine disorder after diabetes, occurring mostly in women of reproductive age. The epidemiology of thyroid dysfunction in women was stated in a study that demonstrated the endocrine effects of thyroid dysfunction as systematic in reproductive health (9). This is due to the rising cases of goiter and thyroid malignancies, forcing more patients to undergo surgical treatment (10). Nonetheless, such operations are not devoid of risk factors, with hypocalcemia, wound infection, hematoma, dysphagia, and nerve injury being the most common complications (11). Varying surgeon experience and a scarce association of perioperative policies increase risks in resource-impeded surgical hospitals (12). According to a study, systemic inflammation and perioperative stress also may affect nerve-related postoperative outcomes, and the analysis should be provided in context (13).

Although developments in technology and surgical training have led to enhanced surgical outcomes, local institutional data correlating surgical complications with many clinical factors is unavailable. This prevents efficient patient counseling and outcome prediction. Consequently, there is a need to produce institution-based evidence, which can aid in risk assessment and surgical planning. The implication is focused on the creation of specific interventions and complication-avoiding strategies, enhancing surgical safety and patient outcomes.

The aim of the study was to evaluate the rates of post-operative complications after total thyroidectomy. It also aimed to determine the demographic and clinical predictors of these complications. Furthermore, this also assessed the development of evidence-based principles of safer thyroid surgery in the tertiary care institutions.

METHODOLOGY

The study employed a cross-sectional study design as a method to measure the incidence of post-operative complications associated with total thyroidectomy. This study was conducted at Unit I, Department of Surgery in Fatima Memorial Hospital (FMH), which took six months after the research protocol was approved. The approval of the institutional review board of FMH was obtained under reference number (Ref: xxxx), and written informed consent was obtained from all the participants before enrollment. A simple random sampling technique with the lottery method was used to diminish selection bias in recruiting patients.

Sample size was determined using OpenEpi version 3.0.0 (released 2013, Atlanta, GA, USA) based on finite population using the estimated population size of 600, frequency of outcome of 50%, absolute precision of 5%, and confidence interval of 95%. The sample size was 235. Inclusion criteria included patients aged between 18-70 years who had undergone total thyroidectomy at FMH. Patients with any type of complication after thyroidectomy, including hypocalcemia, RLN injury, dysphagia, injury to the superior laryngeal nerve, hemorrhage, hypothyroidism, wound infection, or thyroid storm, were included. Exclusion criteria involved a history of prolonged chemotherapy, diabetes, hypertension, cardiovascular disease, and non-compliance with the study protocol.

Since it was an observational study, no intervention was used. Standard surgical procedures were conducted in all patients to complete thyroidectomy, and adherence to protocol was ensured by selecting only patients who had undergone a complete operation to remove the thyroid. The structured proforma was used to collect the data and comprised demographic information, clinical history, pre-operative investigations, intra-operative findings (operative time, blood loss), and post-operative complications. Subsequent calcium levels and hospital stay were also measured.

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SPSS version 26.0 (released 2019, IBM Corp., Armonk, NY) was used to analyze data. Variables were described using frequencies, percentages, and means. Associations between complications and risk factors were estimated using inferential statistics, including the Chi-square and t-tests. A p-value of <0.05 was considered statistically significant.

RESULTS

In this cross-sectional study, 235 patients undergoing total thyroidectomy were included in the study at Fatima Memorial Hospital. This study aimed to establish the frequency of post-surgery diseases and determine demographic and clinical predisposing factors. Hypocalcemia was the frequently occurring complication (78 (33.2%)), with RLN (19 (8.1%)), and dysphagia (15 (6.4%)). Age, gender, BMI, preoperative calcium levels, and blood loss during surgery were significantly associated with complications. Such results demonstrate the importance of preoperative risk stratification and operative accuracy to help reduce avoidable complications. Demographic and clinical characteristics of study participants are listed in Table 1.

Table 1: Demographic and clinical characteristics of study participants

Variable	Values	Test Used	Test Value	p-value
Age (years) (Mean ± SD)	45.3 ± 12.1	t-test	2.18	0.031*
Gender (Male/ Female)	58 (24.7%)/ 177 (75.3%)	Chi-square	6.37	0.012*
BMI<18.5 (Underweight)	11 (4.7%)	ANOVA	3.56	0.029*
18.5–24.9 (Normal)	142 (60.4%)			
≥25 (Overweight/Obese)	82 (34.9%)			
Indications for Surgery Benign/ Malignant	148 (63.0%)/ 87 (37.0%)	Chi-square	8.25	0.004*
Previous Neck Surgery/Radiation Yes/ No	21 (8.9%)/ 214 (91.1%)	Chi-square	4.16	0.041*
Pre-op Calcium Levels Normal/ Abnormal	195 (83.0%)/ 40 (17.0%)	Chi-square	9.12	0.003*
Pre-op Vocal Cord Function Normal/ Abnormal	224 (95.3%)/ 11 (4.7%)	Chi-square	1.78	0.182

*BMI = Basal Metabolic Index, SD = Standard Deviation, % = Percentage, * = statistical significance at <0.05*

The mean age was 45.3 ± 12.1 years and was significantly related to complications (p = 0.031). The complication rates were high in females (177 (75.3%)) compared to males (58 (24.7%), p = 0.012). BMI showed a significant association with overweight (82 (34.9%), p = 0.029). Malignancies (87 (37.0%)) had higher rates of complications compared to benign cases (p = 0.004). Past neck surgery or radiation (21 (8.9%)) was found to be significant (p = 0.041). Pre-op abnormal calcium (40 (17%)) had a high likelihood ratio to predict complications (p = 0.003), whereas the status of vocal cords was not significant. Table 2 summarizes the operative details and postoperative complications.

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Table 2: Operative details and postoperative complications

Variable	Values	Test Used	Test Value	p-value
Blood Loss During Surgery (ml) (Mean ± SD)	110.7 ± 65.4	t-test	2.41	0.017*
Hypocalcemia	78 (33.2%)	Chi-square	18.94	<0.001*
RLN Injury	19 (8.1%)	Chi-square	4.79	0.029*
Dysphagia	15 (6.4%)	Chi-square	3.22	0.072
Hemorrhage	6 (2.6%)	Chi-square	2.48	0.115
Wound Infection	10 (4.3%)	Chi-square	1.75	0.186

*RLN = Recurrent Laryngeal Nerve Injury, SD = Standard Deviation, % = Percentage, * = statistical significance at <0.05*

The mean blood loss was 110.7 ± 65.4 ml, and it was significantly associated with complications (p = 0.017). The most common and statistically significant complications were hypocalcemia 78 (33.2%, p = 0.029) and RLN injury 19 (8.1/%). The occurrence of dysphagia 15 (6.4%), hemorrhage 6 (2.6%), and wound infection 10 (4.3%) was not significant. No case of thyroid storm was reported, implying intraoperative targeted techniques, like nerve monitoring and calcium control, may minimize major complications. Table 3 illustrates the post-operative follow-up and recovery outcomes.

Table 3: Post-operative follow-up and recovery outcomes

Variable	Frequency / Mean ± SD	Test Used	Test Value	p-value
Length of Hospital Stay (days)	2.8 ± 1.2	t-test	2.02	0.045*
Post-op Calcium at Follow-up Normal/ Abnormal	204 (86.8%)/ 31 (13.2%)	Chi-square	7.16	0.007*

*, SD = Standard Deviation, * = statistical significance at <0.05*

The hospitalization lasted 2.8 ± 1.2 days and was significantly higher in patients with complications (p = 0.045). The percentage of patients with abnormal calcium on follow-up was 31 (13.2%), and that was significantly associated with the previous hypocalcemia event (p = 0.007), suggesting that complication-free recovery should focus on regular calcium follow-up and early discharge planning.

DISCUSSION

This study aimed to identify the incidence and factors contributing to postoperative complications after total thyroidectomy in a tertiary care hospital. The findings supported that both patient and clinical variables contribute greatly to postoperative outcomes. The three common complications were hypocalcemia, RLN injury, dysphagia, wound infection, and hemorrhage. These results highlight the significance of preoperative biochemical condition and postoperative surveillance in enhancing the safety of surgery and patient outcomes.

The socio-demographic study indicated that age, gender, and higher BMI had a statistically significant relationship with an elevated risk of complications. Such observation is consistent with the results provided by a study that found obesity and age contributed to a higher risk of wound-related morbidity and hypocalcemia following thyroid surgery (14). Surprisingly, a study also reported that female patients were more likely to experience voice changes after surgery, with such an increase attributed to hormonal and anatomical disparities (15). This demonstrates that demographic profiling of the risk group may be used to determine perioperative planning.

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It was also revealed in the results that preoperative hypocalcemia and the presence of neck surgery or radiation were significant risk factors for complications. The study revealed that low pre-operative calcium levels could be a robust prognostic factor of postoperative hypocalcemia, which is in line with our results (16). Researchers also underlined that neck interventions preceding dissection enhance its technical difficulty and expose it to the risk of nerve damage and bleeding (17). These observations support the necessity of preoperative calcium level correction and a comprehensive history of surgery to reduce the risk.

Hypocalcemia was the most postoperative complication, which aligned with a study of a proportionately similar figure in patients who received total thyroidectomies. Similarly, a study showed that the use of routine calcium supplementation during the perioperative period results in significant prevention of symptomatic hypocalcemia (18). We found this intervention to be a viable strategy. The rate of RLN injury was also notable, and a study explained such injuries by anatomical variabilities and the absence of intraoperative nerve monitoring (19). Their conclusions support our suggestion of nerve identification and neuromonitoring as possible.

A minority of cases had other complications, including dysphagia, wound infection, and hemorrhage. A study found that dysphagia could be caused by the agents of long duration of intubation or traction injury, and not just RLN injury (20). This was supported by our findings, where dysphagia showed no significant correlation with nerve injury. As stated by another study, wound infection rates were lower than 2%, but in our study, it was 4.3%, which can be due to differences in environmental or perioperative hygiene (21). Remarkably, there were no cases of thyroid storm, which is consistent with the study, which concluded near-zero incidence in adequately optimized surgical patients (22, 23).

The variability in compliance with the WHO-recommended surgical practice reported by a study at the tertiary level could affect the outcomes, such as those observed in our data (24). We found that the risk of hemorrhage in patients who had surgery is an intraoperative risk, which a study highlighted as an essential aspect of anticipating intraoperative risks, especially bleeding (25). Another study demonstrated the shortcomings of diagnostic accuracy of preoperative diagnostics in endocrine pathology, emphasizing the necessity of better biochemical preoperative control and preoperative imaging with the use of thyroidectomy (26). A study investigated digital integration in the medical sector, endorsing the adoption of intraoperative monitoring devices and postoperative surveillance devices (27). Finally, another study discussed the systemic implications of metabolic regulations, reaffirming that elements such as calcium metabolism may affect more than just the surgical site (28).

Although our overall results found consistency with the recent literature, there were some minor inconsistencies. As an illustration, our data did not observe a statistically significant correlation between dysphagia and RLN injury; nevertheless, a study reported a strong connection using similar datasets (29). Such a difference can be due to the assessment of timing or the type of surgery.

Readmission can be minimized by using structured discharge plans and calcium follow-up observations that lessen patient discomfort (30). Standard operating procedures, training, equipment investment, and checklists will enable the delivery of safe and consistent care and service in the hospitals.

The single-center study design is a limitation of this research as it diminishes the application of findings to a larger population. The cross-sectional design does not allow interpretation of relationships in a causal context. Other possible confounding factors, including the difference in surgical method or surgeon experience, were not adjusted. Future studies need to consider the incorporation of multi-center prospective studies and standardized outcome definition, possibly longer follow-up, and integration of intraoperative technologies to achieve better outcomes and evidence-based surgical management.

CONCLUSION

The most common complications of total thyroidectomy identified were hypocalcemia and RLN injury. These results were notably linked to patient-related factors, including age, gender, BMI, preoperative calcium levels, and prior neck surgery or radiation. This study achieved its goal by measuring the prevalence of these complications and predictors in a tertiary care hospital.

The results support the significance of comprehensive preoperative assessment, including calcium level adjustment and the evaluation of surgical background to avoid risks. Complication rates can be mitigated through intraoperative measures such as thorough dissection and nerve identification, in addition to postoperative monitoring of calcium. These findings argue in favor of the introduction of standardized surgical approaches and post-operative care pathways to lead to better patient safety, decrease the burden on hospitals, and

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improve outcomes across all types of thyroid surgery. Multicenter studies in the future are encouraged to enhance these findings and inform the national efforts of surgical quality improvement.

AUTHOR CONTRIBUTION

Author	Contribution
Muhammad Haseeb*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Daniyal Amjad	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Mohamed Abdirahman Ali	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published

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