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Original Research Article

Assessing the prevalence of hypocalcemia after total thyroidectomy at a tertiary care hospital

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ABSTRACT

Background: Thyroidectomy is a common surgical procedure for various thyroid disorders, but it often leads to complications such as hypocalcemia. Understanding the prevalence and predictors of hypocalcemia post-total thyroidectomy is crucial for improving patient outcomes.
Methods: This prospective cross-sectional study was conducted at a tertiary care hospital with 100 patients undergoing thyroid surgery, including total thyroidectomy, completion thyroidectomy, and thyroidectomy with neck dissection. We analyzed the incidence of transient and permanent hypocalcemia, examining correlations with surgery type, demographic variables, and postoperative day of onset. Data were collected through patient records and postoperative follow-ups.
Results: The study revealed that 30% of patients experienced hypocalcemia postoperatively. Hypocalcemia was most prevalent among patients undergoing thyroidectomy with neck dissection (58.33%), compared to those undergoing total thyroidectomy (18.18%) and completion thyroidectomy (40.00%). The majority of hypocalcemia cases (66.67%) occurred on the second postoperative day. Most hypocalcemia instances were transient (86.67%), with a smaller fraction being permanent (13.33%).
Conclusions: Hypocalcemia remains a significant complication following thyroid surgery, particularly in surgeries involving neck dissection. Early identification and management of at-risk patients could mitigate the severity of this complication. Our findings underscore the importance of vigilant monitoring and tailored postoperative care to minimize the impact of hypocalcemia on patient recovery and quality of life.

Keywords: Hypocalcemia, Postoperative complications, Thyroid surgery, Thyroidectomy

INTRODUCTION

Thyroid surgery, encompassing procedures such as total thyroidectomy, plays a pivotal role in the management of various thyroid disorders including cancer, multinodular goitre, and Graves' disease. These conditions necessitate precise surgical interventions to mitigate symptoms and prevent malignancy progression. Over the years, thyroidectomy has become a prevalent procedure globally due to the rising incidence of thyroid diseases. Advancements in surgical techniques have significantly improved outcomes, enhancing the safety and efficacy of these procedures.[1,2] The evolution of thyroid surgery has been marked by significant advancements, particularly in the approach and technology used.[3,4] Traditional methods have transitioned to more refined techniques that reduce the risk of complications and enhance recovery times. Innovations such as intraoperative neuromonitoring and capsular dissection techniques have contributed to the reduction in nerve damage and improved postoperative outcomes.[5] Despite these advancements, thyroid surgery is not devoid of risks, with hypocalcemia being one of the most common complications. This condition arises due to inadvertent damage to or removal of the parathyroid glands, which play a crucial role in calcium homeostasis. The rates of transient and permanent hypocalcemia post-thyroidectomy vary widely but remain a significant clinical concern. Studies report transient hypocalcemia in 1.5% to 30% of cases and permanent hypocalcemia in up to 3% of cases, depending on the extent of surgery and the surgical technique employed.[6-8] The parathyroid glands, typically four in number, are located on the posterior surface of the thyroid gland. These small glands are vital for the regulation of serum calcium levels through the secretion of parathyroid hormone (PTH). The anatomical variability and small size of these glands pose surgical challenges, particularly during thyroidectomy, where their preservation is critical to preventing postoperative hypocalcemia.[9,10] Damage to or removal of these glands can lead to significant decreases in PTH, resulting in hypocalcemia, which adversely affects muscle function and neuronal conductivity, thereby impacting patient quality of life.[11] In Bangladesh, the prevalence of thyroid diseases and the outcomes of thyroid surgeries mirror global patterns but with localized variations that influence surgical approaches and patient outcomes. However, comprehensive data on the incidence of surgical complications such as hypocalcemia in the Bangladeshi population are lacking. Such data are crucial for developing tailored guidelines and enhancing surgical training to mitigate these risks.[12] The need for the current study is underscored by the absence of localized data regarding the prevalence and management of hypocalcemia post-thyroidectomy in Bangladesh. By assessing the incidence of hypocalcemia in a tertiary care setting, this research aims to fill a significant gap in the local endocrine surgery literature. The current study hopes to provide insights into the effectiveness of current surgical techniques and the adequacy of intraoperative parathyroid gland preservation, potentially guiding future improvements in surgical education and patient care in the region.

METHODS

This prospective cross-sectional study was conducted at the Department of Otolaryngology and Head-Neck Surgery, National Institute of Ear, Nose and Throat (ENT), Bangladesh, over a one-year period from January 2023 to December 2023.

The study included 100 cases, chosen through purposive sampling, from patients diagnosed with thyroid neoplasm or multinodular goitre and admitted for surgery within the specified timeframe. The inclusion criteria focused on patients scheduled for total thyroidectomy or completion thyroidectomy, while those scheduled for subtotal or near total thyroidectomy, as well as patients who dropped out of follow-up, were excluded. Prior to surgery, each patient underwent preoperative investigations including serum calcium level measurements as part of the study protocol. Surgeries were performed by experienced senior surgeons, emphasizing the careful identification and preservation of parathyroid glands. Postoperative monitoring involved routine measurements of serum calcium on the 1st and 5th postoperative days for all patients, with additional tests when tetany symptoms appeared. Data were systematically collected using a standardized data collection sheet during post-admission interviews, clinical examinations, and necessary investigations for conditions like thyroid carcinoma, multinodular goitre, and Graves' disease. The collected data were subsequently verified, edited, and analyzed using SPSS software (V25). In terms of ethical considerations, the study complied with the Helsinki Declaration of 1964 for medical research involving human subjects. Detailed information about the study's design and objectives was verbally provided to all participants, who gave their informed consent before enrollment. Participants were assured of their right to withdraw from the study at any point without repercussions. All research activities adhered to strict ethical guidelines, ensuring the integrity and confidentiality of participant data.

RESULTS

Gender representation in the study was predominantly female, constituting 72% of the sample, while males accounted for 28%. Age distribution showed a higher concentration in the middle age brackets, with 34% of participants between 31-40 years and 26% between 21-30 years. The study included a diverse range of occupations, with a significant majority being housewives (68%), followed by farmers (10%), and those in service (8%). The participants predominantly resided in rural areas, making up 94% of the total, with only a small fraction from urban settings (6%) (Table 1).

The majority of the cases involved multinodular goiter, which was diagnosed in 57% of the participants, while Papillary thyroid carcinoma was present in 37% of the cases. Less common were medullary thyroid carcinoma, graves' disease and follicular thyroid carcinoma, each constituting 2% of the diagnoses. Regarding the clinical presentation, the majority of participants (76%) presented with only thyroid swelling. However, a significant portion, 24% of the participants, exhibited thyroid swelling with nodal metastasis (Table 2).

The most common procedure performed was total thyroidectomy, accounting for 66% of the surgeries. Completion thyroidectomy was less frequent, carried out in 10% of the cases. A considerable number of participants, 24%, underwent thyroidectomy in conjunction with neck dissection (Table 3).

Table 1: Distribution of participants by baseline characteristics (n=100).

Variables	Frequency	Percentage
Gender		
Male	28	28.00
Female	72	72.00
Age in years		
10-20	6	6.00
21-30	26	26.00
31-40	34	34.00
41-50	14	14.00
>50	20	20.00
Occupation		
Service	8	8.00
Business	4	4.00
Housewife	68	68.00
Farmer	10	10.00
Others	10	10.00
Residence		
Rural	94	94.00
Urban	6	6.00

Table 2: Case diagnosis and clinical presentation among the participants (n=100).

Variables	Frequ-ency	Percen-tage
Diagnosis		
Multinodular goiter	57	57.00
Papillary thyroid carcinoma	37	37.00
Medullary thyroid carcinoma	2	2.00
Graves' disease	2	2.00
Follicular thyroid carcinoma	2	2.00
Presentation		
Only thyroid swelling	76	76.00
Thyroid swelling with nodal metastasis	24	24.00

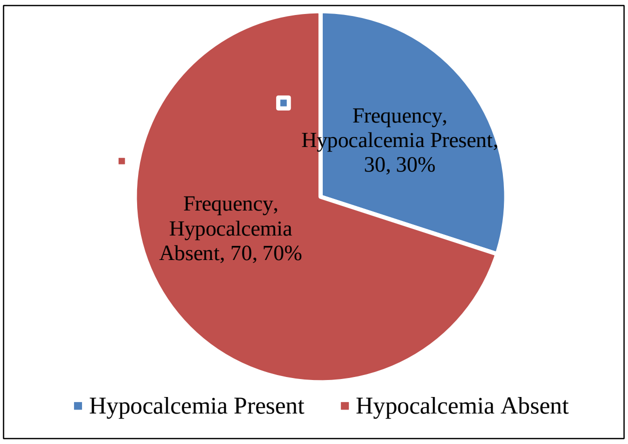

Figure 1: Distribution of surgery types among the participants (n=100).

Out of the 100 individuals who underwent thyroid surgery, 30% experienced hypocalcemia postoperatively. Conversely, 70% did not develop this condition (Figure 1).

Table 3: Frequency of hypocalcaemia on the basis of extent of surgery (n=100).

Variables	Frequency	Percentage
Total thyroidectomy (n=66)		
Hypocalcemia present	12	18.18
Hypocalcemia absent	54	81.82
Completion thyroidectomy (n=10)		
Hypocalcemia present	4	40.00
Hypocalcemia absent	6	60.00
Thyroidectomy and neck dissection (n=24)		
Hypocalcemia present	14	58.33
Hypocalcemia absent	10	41.67

Of the 66 patients who underwent a total thyroidectomy, hypocalcemia was present in 12 cases (18.18%), while the majority, 54 cases (81.82%), did not exhibit hypocalcemia. A higher incidence of hypocalcemia was noted in patients who had a completion thyroidectomy, with 4 out of 10 cases (40.00%) developing the condition. The group that underwent thyroidectomy with neck dissection had the highest rate of hypocalcemia, with 14 out of 24 cases (58.33%) experiencing this complication (Table 3).

Table 4: Time interval for development of hypocalcaemia after thyroid surgery (n=30).

Time interval	Frequency	Percentage
1st POD	2	6.67
2nd POD	20	66.67
3rd POD	6	20.00
4th POD	2	6.67

The majority of cases (20, representing 66.67%) developed hypocalcemia on the second postoperative day (POD), indicating this as the most critical period for monitoring serum calcium levels. The first and fourth PODs saw the lowest occurrence, each with 2 cases (6.67%). The third POD had 6 cases (20.00%) reporting hypocalcemia (Table 4).

Table 5: Types of hypocalcaemia according to clinical manifestation (n=30).

Type	Frequency	Percentage
Clinical	20	66.67
Sub-clinical	10	33.33

Clinical hypocalcemia, characterized by observable symptoms, occurred in 20 cases (66.67%), while sub-clinical hypocalcemia, which may lack overt signs, was present in 10 cases (33.33%) (Table 5).

Table 6: Type of hypocalcaemia after thyroid surgery (n=30).

Type of hypocalcaemia	Frequency	Percentage
Temporary	26	86.67
Permanent	4	13.33

A significant majority of the cases, 26 participants (86.67%), experienced temporary hypocalcemia, suggesting a resolution of the condition without long-term complications. However, 4 participants (13.33%) developed permanent hypocalcemia, indicating a need for ongoing management and treatment (Table 6).

DISCUSSION

Gender prevalence in our cohort was prominently skewed towards females, representing 72% of the sample. This aligns with the broader trend observed in thyroid pathology where females are disproportionately affected, a pattern corroborated by Pattou et al, who found a similar gender distribution in their study.[13] Additionally, Chen et al, report a significant number of their pediatric thyroidectomy subjects being female, indicating the need for gender-tailored preoperative counseling and postoperative care.[14] Age distribution in our study is noteworthy, with a higher concentration in the 31-40 year age bracket. This is congruent with findings by Puzziello et al, who noted that age can be a determinant in the development of postoperative hypocalcemia.[7]

The predilection for younger adults having thyroid surgery necessitates vigilant follow-up, particularly as they are in their prime working years, and the implications of surgical complications can have long-lasting effects. Our procedure types showed a predominance of total thyroidectomy at 66%, consistent with the literature, such as Güllüoğlu et al, where total thyroidectomy was frequently performed.[15] However, we note a higher incidence of hypocalcemia post-total thyroidectomy (18.18%) compared to the incidence reported by Raffaelli et al, suggesting variations in surgical technique or patient management may influence outcomes.[16] The postoperative development of hypocalcemia in our study was seen in 30% of patients, significantly higher than reported by Seo et al, where a lower rate of transient and permanent hypocalcemia was observed.[17]

This disparity may be attributed to differences in the extent of surgery, with our cohort having a considerable number of thyroidectomies with neck dissection, known to increase hypocalcemia risk due to potential parathyroid gland compromise. The majority of hypocalcemia cases in our study manifested on the second postoperative day, which suggests the need for a focused monitoring protocol during this critical period. This observation is supported by the study from Pattou et al, which identified the immediate postoperative period as a high-risk time for hypocalcemia development.[13] When discussing clinical versus subclinical hypocalcemia, our study found a majority of clinically symptomatic cases (66.67%). Kim et al, provide a useful comparison, highlighting the importance of early detection and management of hypocalcemia to prevent symptomatic manifestations, which may have significant clinical consequences.[18] Examining the nature of hypocalcemia further, our data revealed 80% of cases to be temporary. This rate of temporary hypocalcemia is similar to findings by Chen et al, where a significant number of pediatric patients recovered parathyroid function within a month post-surgery.[14]

This suggests that with proper management, temporary hypocalcemia can be resolved without long-term impact, though our rate of permanent hypocalcemia (13.33%) remains a concern. Our discussion benefits from considering a wider range of literature, including the study by Raffaelli et al, where they found that even patients with normal postoperative parathyroid hormone levels could experience significant hypocalcemia.[16] This underscores the complexity of predicting postoperative hypocalcemia and the need for comprehensive patient monitoring. In conclusion, while our findings offer valuable insights into the local population's response to thyroid surgery, they also reflect broader trends reported in the literature. A multidisciplinary approach, encompassing surgical technique refinement, careful intraoperative parathyroid gland management, and tailored postoperative monitoring, can mitigate the risk of hypocalcemia and enhance patient outcomes.

This study has few limitations. The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

In conclusion, our study on the prevalence of hypocalcemia post-total thyroidectomy at a tertiary care hospital provides a comprehensive analysis of the factors influencing this common surgical complication. We found that the majority of the surgeries were total thyroidectomies, with a significant prevalence of hypocalcemia, particularly among those who underwent surgery combined with neck dissection. Our findings underscore the critical need for meticulous surgical technique and vigilant postoperative monitoring, especially on the second postoperative day when the incidence of hypocalcemia peaks. While most cases of hypocalcemia were temporary, the occurrence of permanent hypocalcemia in a considerable number of patients highlights the ongoing need for enhanced surgical training and patient management protocols. By comparing our results with existing literature, we conclude that careful preservation of the parathyroid glands during surgery, coupled with immediate and appropriate management of calcium levels postoperatively, can significantly improve patient outcomes. This study contributes valuable insights into the management of thyroid surgery patients and lays the groundwork for future research aimed at reducing the incidence and severity of postoperative hypocalcemia.

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