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# Complications Rates and Recurrence in Hemithyroidectomy vs Total Thyroidectomy for Papillary Thyroid Carcinoma

Mohammad Anwar Hossain[1*], Arif Mahmud Jewel[2], Tawfiqur Rahman[3]

1Medical Officer, Department of Otolaryngology-Head & Neck Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh
2Medical Officer, Department of Otolaryngology-Head & Neck Surgery, Bangabandhu Sheikh Mujib medical University, Dhaka, Bangladesh
3Medical Officer, Department of Otolaryngology-Head & Neck Surgery, Bangabandhu Sheikh Mujib medical University, Dhaka, Bangladesh

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***Corresponding author:** Mohammad Anwar Hossain
Medical Officer, Department of Otolaryngology-Head & Neck Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

**Abstract** **Original Research Article**

***Background:*** The choice between hemithyroidectomy (HT) and total thyroidectomy (TT) in the treatment of papillary thyroid carcinoma (PTC) remains a subject of ongoing debate, particularly in terms of complication rates, recurrence, and patient satisfaction. This study aimed to compare the surgical outcomes between HT and TT in a cohort of PTC patients. ***Methods:*** This retrospective cohort study reviewed the medical records of 79 patients diagnosed with PTC, divided into two groups: Group 1 (n = 39) underwent HT, while Group 2 (n = 40) underwent TT. Data on patient demographics, tumor characteristics, intraoperative and postoperative complications, recurrence, and patient satisfaction were analyzed. Statistical analyses were performed using Chi-square tests, with a p-value of <0.05 considered statistically significant. ***Results:*** The mean age of patients in both groups was similar). Intraoperative complications, particularly bleeding, were more frequent in Group 2 (32.50%) compared to Group 1 (10.26%). Postoperative complications, including persistent hypocalcemia, were higher in Group 2, affecting 10.00% of patients, while none were reported in Group 1. Group 1 experienced a shorter hospital stay (3 ± 1.82 days) compared to Group 2 (7 ± 4.24 days). Recurrence rates were slightly higher in Group 1 (7.69%) compared to Group 2 (5.00%), but the difference in local recurrence was significant (2.56% in Group 1 vs. 0% in Group 2). Persistance hoarseness of voice was observed in 0% among group 1 patients and 2.5% among group 2. Overall patient satisfaction was high in both groups, with 82.05% of Group 1 and 75.00% of Group 2 reporting satisfaction, although dissatisfaction was higher in Group 2. ***Conclusion:*** Hemithyroidectomy offers significant advantages in terms of fewer complications, shorter hospital stays, and higher patient satisfaction, making it a suitable option for low-risk PTC patients. Hemithyroidectomy also reported no long term hoarseness of voice, while slight presence was observed in the total thyroidectomy. However, total thyroidectomy remains the preferred option for reducing recurrence in low-risk patients. Personalized surgical approaches are essential to balance recurrence risks and complications while optimizing patient outcomes.

**Keywords:** Papillary Thyroid Carcinoma, Hemithyroidectomy, Total Thyroidectomy, Complication Rates, Recurrence, Hypocalcemia, Patient Satisfaction.



## INTRODUCTION

Papillary thyroid carcinoma (PTC) is the most common type of thyroid malignancy, accounting for over 80% of all thyroid cancers globally. The incidence of PTC has been steadily rising worldwide, attributed partly to advancements in diagnostic imaging and screening protocols, leading to the increased detection of small, asymptomatic tumors. In South Asia, particularly countries like Sri Lanka, a notable threefold increase in thyroid cancer incidence in women and a twofold rise in men have been reported from 2005 to 2019, reflecting similar global trends (1). In regions like Taiwan, there has been a 2.2- and 4.2-fold increase in the incidence and prevalence of thyroid cancer, respectively, with PTC being the predominant subtype, emphasizing the critical need to understand its epidemiology and optimize treatment approaches (2). Despite these advancements, the pathophysiology of

PTC remains consistent with its well-differentiated, slow-growing nature, often presenting as localized disease. When diagnosed early, PTC has an excellent prognosis, with long-term survival rates remaining favorable, even in cases where the disease has metastasized (3). The indolent behavior of PTC and its localized presentation underscore the importance of tailored therapeutic strategies aimed at minimizing treatment-related morbidity while maintaining optimal oncologic outcomes. Surgical intervention remains the cornerstone of PTC management, with two primary approaches widely practiced: hemithyroidectomy (HT) and total thyroidectomy (TT). TT has been the traditional treatment of choice for larger tumors and cases involving lymph node metastasis or extrathyroidal extension, while HT is increasingly being recommended for patients with low-risk, small tumors (4). Recent shifts in clinical guidelines from major endocrinological associations, including the American Thyroid Association, advocate for a less aggressive approach in selected cases, favoring HT for tumors smaller than 4 cm that do not exhibit aggressive histopathological features (5). This shift towards HT is driven by its association with a reduced risk of postoperative complications, making it a preferred option for many clinicians when managing low-risk cases of PTC. Complication rates associated with these surgical approaches significantly impact clinical decision-making. Meta-analyses have consistently shown that HT is associated with lower rates of surgical complications compared to TT. Specifically, patients undergoing HT have a significantly reduced risk of temporary vocal fold paralysis (3.3% vs. 4.5%) and temporary hypoparathyroidism (2.2% vs. 21.3%) when compared to those undergoing TT (6). Permanent hypoparathyroidism, a serious and lifelong complication, was reported to be absent in the HT group but present in 1.8% of TT patients, highlighting the safety profile of the less extensive surgical approach (6). Despite these benefits, the recurrence rates following HT are higher compared to TT. Studies indicate that the overall recurrence rate for HT can reach up to 3.8% as opposed to 1.0% for TT, emphasizing the need for a balanced decision-making process that weighs the risks of recurrence against the potential for postoperative complications (6). The rationale for selecting either HT or TT as the surgical approach is multifaceted, involving a detailed evaluation of patient-specific factors such as tumor size, age, presence of lymph node involvement, and the extent of extrathyroidal extension. Patients with low-risk PTC, particularly those with tumors measuring less than 1 cm in size, often achieve satisfactory outcomes with HT, thereby avoiding the higher morbidity associated with TT (7). In contrast, patients with more advanced disease, characterized by larger tumors or evidence of nodal metastasis, are more likely to benefit from the comprehensive approach of TT to minimize the risk of locoregional recurrence (8). These tailored approaches are further validated by cost-effectiveness analyses, which suggest that although TT may initially be more expensive, its lower recurrence rates could offset the long-term costs associated with additional treatments and follow-ups required after HT (9). The increasing trend toward conservative surgical management has been bolstered by evidence indicating that hemithyroidectomy is sufficient for achieving favorable oncological outcomes in appropriately selected patients. For example, a prospective study from Bangladesh involving 300 patients undergoing HT demonstrated that the majority of these patients did not experience recurrence post-surgery, reinforcing HT's role as a viable and safe alternative to TT in low-risk cases (10). Additionally, systematic reviews have highlighted that while HT can be associated with slightly higher recurrence rates, it remains a reasonable option for patients with low-risk tumors, provided that thorough preoperative evaluations are conducted to rule out aggressive disease features (11). Despite the advantages of HT in reducing complications, the higher recurrence rates associated with this approach necessitate a careful and individualized surgical plan, particularly in regions like Bangladesh where resource constraints might influence postoperative surveillance and management strategies. The emphasis on tailored treatment strategies based on individual risk assessments is crucial for improving patient outcomes, especially in low-resource settings where the burden of complications could be significantly detrimental (12). Given the evolving landscape of PTC management, understanding the implications of these surgical choices within specific demographic and healthcare contexts remains vital. This study aims to further elucidate the comparative complication rates and recurrence between HT and TT in the Bangladeshi population, providing valuable insights into the most effective surgical strategies tailored to regional healthcare dynamics. By addressing these aspects, the findings will contribute to a more nuanced understanding of the risk-benefit profile of each surgical approach, ultimately guiding clinicians in making informed decisions to optimize patient care.

## METHODS

This retrospective comparative cohort analysis was conducted to evaluate the complication rates and recurrence in patients undergoing hemithyroidectomy (Group 1) versus total thyroidectomy (Group 2) for papillary thyroid carcinoma (PTC). The study was carried out at the Department of Otolaryngology-Head & Neck Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh, from 1st January 2015 to June 2022. The study included records of surgery done between January 2015 to December of

2015. Medical records of patients diagnosed with PTC during the study period were reviewed. Patients were categorized into two groups based on the surgical treatment they had received. Group 1 included 39 patients who underwent hemithyroidectomy, while Group 2 consisted of 40 patients who received total thyroidectomy. Inclusion criteria for the study were patients aged 18-45 years, tumor size ≤4 cm, intrathyroidal tumor, diagnosed with PTC, and who had undergone either hemithyroidectomy or total thyroidectomy as their initial treatment. Exclusion criteria involved patients with incomplete medical records, previous thyroid surgery, a history of radiation therapy, extrathyroidal tumors, regional or distant metastasis cases, or those with concurrent non-PTC thyroid malignancies. Data collected from the medical records included patient demographics such as age and gender, tumor characteristics like size, lymph node involvement, and the presence of extrathyroidal extension. Postoperative outcomes, including complication rates (such as hypoparathyroidism and vocal fold paralysis) and disease recurrence, were also meticulously documented for each patient. Statistical analysis was performed to compare the complication rates and recurrence between the two groups. Categorical variables were analyzed using Chi-square tests to assess the differences in outcomes between hemithyroidectomy and total thyroidectomy. A p-value of less than 0.05 was considered statistically significant, indicating a meaningful difference in clinical outcomes between the groups. All statistical analyses were conducted using appropriate software to ensure accurate and reliable results. Ethical approval for this study was obtained from the institutional review board of Bangabandhu Sheikh Mujib Medical University, ensuring adherence to ethical guidelines and patient safety protocols. All patient data were anonymized to maintain confidentiality and to protect patient privacy throughout the study process.

## RESULTS

**Table 1: Distribution of baseline characteristics among the participants (N=79)**

| Basic Characteristics | Group 1 (n=39) | | Group 2 (n=40 | | P-value |
|---|---|---|---|---|---|
| **Age at Surgery** | 37.31±4.82 | | 36.17±4.23 | | -- |
| **Gender** | | | | | |
| Male | 13 | 33.33% | 13 | 32.50% | >0.05 |
| Female | 26 | 66.67% | 27 | 67.50% | |
| **Residence** | | | | | |
| Urban | 9 | 23.08% | 8 | 20.00% | >0.05 |
| Rural | 30 | 76.92% | 32 | 80.00% | |
| **Occupation** | | | | | |
| Employed | 6 | 15.38% | 7 | 17.50% | >0.05 |
| Unemployed | 13 | 33.33% | 9 | 22.50% | |
| Housewife | 20 | 51.28% | 23 | 57.50% | |
| retired | 0 | 0.00% | 0 | 0.00% | |
| **F/H of Thyroid Cancer** | | | | | |
| Yes | 2 | 5.13% | 6 | 15.00% | >0.05 |
| No | 37 | 94.87% | 34 | 85.00% | |

The baseline characteristics of the study participants are summarized in Table 1. The mean age at the time of surgery for Group 1 (hemithyroidectomy) was 37.31 ± 4.82 years, while in Group 2 (total thyroidectomy) it was 36.17 ± 4.23 years. There was no statistically significant difference in the age distribution between the two groups. In terms of gender distribution, both groups had a similar proportion of males and females, with males accounting for 33.33% and 32.50% in Group 1 and Group 2, respectively, and females making up 66.67% and 67.50%, respectively ($p > 0.05$). Regarding the participants' place of residence, the majority of patients in both groups came from rural areas, with 76.92% in Group 1 and 80.00% in Group 2. Similarly, the distribution of occupation showed that housewives constituted the largest subgroup, representing 51.28% in Group 1 and 57.50% in Group 2, followed by employed individuals at 15.38% and 17.50%, respectively. The unemployed category comprised 33.33% in Group 1 and 22.50% in Group 2. None of the participants in either group were retired. A positive family history of thyroid cancer was noted in 5.13% of patients in Group 1 and 15.00% in Group 2, though this difference was not statistically significant ($p > 0.05$).

**Table 2: Distribution of clinical presentation among the participants (N=79)**

| Clinical Presentation | Group 1 (n=39) | Group 2 (n=40) | P-value |
|---|---|---|---|
| **Size of tumor (in cm)** | 3.1±0.86 | 3.3±0.21 | - |

| | | | | | |
|---|---|---|---|---|---|
| **Location of Tumor** | | | | | |
| Left Thyroid tumor | 17 | 43.59% | 19 | 47.50% | **<0.01** |
| Right Thyroid tumor | 22 | 56.41% | 21 | 52.50% | |
| **FNAC Report** | | | | | |
| Papillary thyroid carcinoma | 29 | 74.36% | 35 | 87.50% | **<0.001** |
| Suspicious for malignancy | 5 | 12.82% | 5 | 12.50% | |
| Benign | 5 | 12.82% | 0 | 0.00% | |

The clinical presentation of the participants is outlined in Table 2. The average tumor size in Group 1 (hemithyroidectomy) was 3.1 ± 0.86 cm, while in Group 2 (total thyroidectomy) it was slightly larger, at 3.3 ± 0.21 cm. The distribution of tumor location was relatively even between the groups, with 43.59% of Group 1 and 47.50% of Group 2 presenting with tumors in the left thyroid, and 56.41% of Group 1 and 52.50% of Group 2 having tumors in the right thyroid. This difference in tumor location distribution was statistically significant ($p < 0.01$). Fine needle aspiration cytology (FNAC) results indicated that the majority of participants in both groups were diagnosed with papillary thyroid carcinoma (PTC). Specifically, 74.36% of Group 1 and 87.50% of Group 2 were confirmed to have PTC, a statistically significant difference between the two groups ($p < 0.001$). Additionally, 12.82% of participants in both groups had FNAC results that were suspicious for malignancy. Interestingly, 12.82% of patients in Group 1 had benign FNAC findings, while none in Group 2 showed benign results ($p < 0.001$).

**Table 3: Distribution of surgical details among the participants (N=79)**

| **Surgical Details** | **Group 1 (n=39)** | | **Group 2 (n=40)** | | **P-value** |
|---|---|---|---|---|---|
| **Duration of surgery (in hours)** | 1.1±0.45 | | 2.1±0.82 | | - |
| **Intra operative Complications** | | | | | |
| None | 35 | 89.74% | 27 | 67.50% | >0.05 |
| Bleeding | 4 | 10.26% | 13 | 32.50% | |

Table 3 presents the surgical details of the participants. The average duration of surgery was significantly shorter in Group 1 (hemithyroidectomy), with a mean of 1.1 ± 0.45 hours, compared to Group 2 (total thyroidectomy), which had a mean duration of 2.1 ± 0.82 hours. Intraoperative complications were more frequent in Group 2. While 89.74% of patients in Group 1 experienced no complications during surgery, only 67.50% of Group 2 had no intraoperative complications. Bleeding was the most common complication, occurring in 10.26% of Group 1 and 32.50% of Group 2 participants, though this difference was not statistically significant ($p > 0.05$).

**Table 4: Distribution of postoperative outcomes among the participants (N=79)**

| **Postoperative outcomes** | **Group 1 (n=39)** | | **Group 2 (n=40)** | | |
|---|---|---|---|---|---|
| **Length of Hospital stay (in days)** | 3±1.82 | | 7±4.24 | | **<0.05** |
| **Postoperative Complications** | | | | | |
| Hematoma | 3 | 7.69% | 3 | 7.50% | >0.05 |
| Hypocalcemia | 2 | 5.13% | 15 | 37.50% | |
| Hoarseness of Voice | 2 | 5.13% | 4 | 10.00% | |
| Infection | 0 | 0.00% | 2 | 5.00% | |
| Wound Dehiscence | 0 | 0.00% | 2 | 5.00 | |
| **Vocal Cord Function Post-surgery** | | | | | |
| Normal | 37 | 94.87% | 36 | 90.00% | >0.05 |
| Unilateral palsy | 2 | 5.13% | 4 | 10.00% | |
| Histopathologically confirmed Papillary thyroid carcinoma | 39 | 100.00% | 40 | 100.00% | -- |
| Radioactive Iodine Therapy Post-surgery | 0 | 0.00% | 40 | 100.00% | >0.05 |
| Recurrence detected During follow up | 3 | 7.69% | 2 | 5.00% | **<0.005** |

Table 4 presents the postoperative outcomes of the participants. The length of hospital stay was significantly shorter for patients in Group 1 (hemithyroidectomy) with an average of 3 ± 1.82 days, compared to 7 ± 4.24 days in Group 2 (total thyroidectomy), a difference that was statistically significant ($p < 0.05$). In terms of postoperative complications, the rates of hematoma were slightly higher in Group 1 at 7.69%, compared to 7.5% in Group 2. Hypocalcemia was more prevalent in Group 2, with 5.13% cases in Group 1 and 37.50% in Group 2 patients, while hoarseness of voice was reported at 5.13% in Group 1 and 10.00% in Group 2. No infections were reported in group 1, while it was 5% in group 2. Wound dehiscence was also observed in only 5% in group 2, and none in group 1. None of these complications reached statistical significance ($p > 0.05$). Postoperative vocal cord function was largely preserved in both groups, with normal function observed in 92.31% of Group 1 and 90.00% of Group 2 patients. Unilateral vocal cord palsy was observed in 7.69% of Group 1 and 10.00% of Group 2, but the difference was not statistically significant ($p > 0.05$). All patients in both groups had their diagnosis of papillary thyroid carcinoma (PTC) confirmed histopathologically (100%). Notably, only patients in Group 2 received postoperative radioactive iodine therapy, with 100% of Group 2 undergoing this treatment, compared to none in Group 1. Recurrence of PTC during follow-up was observed in 7.69% of Group 1 patients and 5.00% of Group 2 patients. This difference in recurrence rates was statistically significant ($p < 0.005$), indicating a slightly higher recurrence rate in the hemithyroidectomy group.

**Table 5: Distribution of follow-up details among the participants (N=79)**

| Follow-up Details | Group 1 (n=39) | | Group 2 (n=40) | | P-value |
|---|---|---|---|---|---|
| **Follow-up duration (in month)** | 81±2.4 | | 80±1.93 | | - |
| **Recurrence location** | | | | | |
| Local recurrence | 1 | 2.56% | 0 | 0.00% | **<0.05** |
| Regional lymph node | 2 | 5.13% | 2 | 5.00% | |
| **Long term complications** | | | | | |
| Persistent hypocalcemia | 0 | 0.00% | 4 | 10.00% | >0.05 |
| Persistent Hoarseness of Voice | 0 | 0.00% | 1 | 2.50% | |
| **Patient satisfaction with outcome** | | | | | |
| Very satisfied | 4 | 10.26% | 3 | 7.50% | |
| Satisfied | 32 | 82.05% | 30 | 75.00% | >0.05 |
| Unsatisfied | 3 | 7.69% | 6 | 15.00% | |
| Very unsatisfied | 0 | 0.00% | 1 | 2.50% | |

Table 5 summarizes the follow-up details of the participants. The average follow-up duration was similar between the two groups, with Group 1 (hemithyroidectomy) having a mean follow-up of 81 ± 2.4 months and Group 2 (total thyroidectomy) having a follow-up of 80 ± 1.93 months. In terms of recurrence location, 2.56% of patients in Group 1 experienced local recurrence, whereas none of the patients in Group 2 had local recurrence ($p < 0.05$). Both groups had an equal incidence of regional lymph node recurrence, with 5.13% of patients in Group 1 and 5.00% in Group 2 experiencing recurrence in the regional lymph nodes. Regarding long-term complications, persistent hypocalcemia was observed in 10.00% of Group 2 patients, while none of the patients in Group 1 developed this complication. Persistent hoarseness of voice was noted in 2.50% of Group 2 patients, while no cases were reported in Group 1. None of these differences were statistically significant ($p > 0.05$). Patient satisfaction with outcomes was generally high in both groups. In Group 1, 10.26% of patients reported being very satisfied, and 82.05% were satisfied, while in Group 2, 7.50% of patients were very satisfied, and 75.00% were satisfied. A higher percentage of Group 2 patients (15.00%) were unsatisfied with the outcomes compared to 7.69% in Group 1, though no statistically significant difference was observed in overall satisfaction between the groups ($p > 0.05$). Only one patient in Group 2 reported being very unsatisfied with their outcome (2.50%).

## DISCUSSION

The current study compared the complication rates, recurrence, and patient satisfaction between hemithyroidectomy (HT) and total thyroidectomy (TT) in patients with papillary thyroid carcinoma (PTC). The findings highlight key differences in outcomes related to intraoperative complications, recurrence rates, long-term morbidity, and patient-reported satisfaction, which align with the global shift in thyroid cancer management towards more conservative surgical approaches. In terms of patient demographics, the mean age and gender distribution between the two groups were similar. These findings are consistent with other studies, such as those by Ji et al., who found no significant differences in age distribution but did report larger tumors in patients undergoing total

thyroidectomy due to the higher likelihood of lymph node involvement and extrathyroidal extension in this group (13). Similarly, Hsiao et al. noted that patients with larger tumors and more advanced disease tend to undergo TT, which typically necessitates more extensive surgical interventions (6). Regarding intraoperative complications, Group 2 (TT) exhibited a higher rate of bleeding (32.50%) compared to Group 1 (HT), which had a lower rate (10.26%). This observation is supported by multiple studies that highlight the increased complexity and longer duration of total thyroidectomy procedures, which contribute to higher intraoperative complication rates, particularly bleeding (6,14). Abboud et al. similarly reported that TT is associated with a greater risk of intraoperative bleeding and postoperative complications, a factor that is pivotal when deciding the extent of surgery (15). Postoperative outcomes, such as hypocalcemia, were also more common in Group 2 (TT). Persistent hypocalcemia was present in 10% of TT patients but absent in those who underwent hemithyroidectomy. This is a well-documented phenomenon in the literature. Both Hsiao et al. and Materazzi et al. emphasized that total thyroidectomy is associated with a significantly higher risk of both transient and permanent hypocalcemia due to the increased likelihood of inadvertent parathyroid gland injury during the procedure (6,15). Conversely, hemithyroidectomy preserves more thyroid and parathyroid tissue, reducing the risk of postoperative hypocalcemia. These findings align closely with the outcomes observed in this study. Recurrence rates, both overall and local, were marginally higher in the HT group (7.69%) compared to the TT group (5.00%), although the difference in local recurrence (2.56% in HT vs. 0% in TT) was statistically significant. This result is consistent with other studies, such as the work by Hurtado-López et al., who found a higher recurrence rate following hemithyroidectomy, particularly in low-risk PTC patients (16). Hsiao et al. also noted that recurrence rates tend to be slightly higher in hemithyroidectomy patients, especially for contralateral lobe recurrence, due to the remaining thyroid tissue, which may harbor residual cancer cells (6). However, despite the higher recurrence rates in hemithyroidectomy patients, the difference in long-term survival outcomes remains negligible. Ji et al. highlighted that for carefully selected low-risk patients, hemithyroidectomy offers an oncologically safe alternative to total thyroidectomy, as recurrence does not significantly impact overall survival (13). Patient satisfaction, an increasingly important outcome in surgical decision-making, was generally high in both groups, with 82.05% of Group 1 (HT) and 75.00% of Group 2 (TT) reporting satisfaction. However, more patients in the total thyroidectomy group expressed dissatisfaction with their outcomes, which can be attributed to the higher rates of complications such as hypocalcemia and the more invasive nature of the surgery. Studies such as those by Bongers et al. and Geron et al. support these findings, as they observed similar trends where patients who underwent hemithyroidectomy reported fewer complications and a higher quality of life (17,18). The lower complication rates in hemithyroidectomy patients often translate into higher satisfaction, especially when long-term morbidity is considered (17). The shorter hospital stay observed in Group 1 (3 ± 1.82 days) compared to Group 2 (7 ± 4.24 days) also contributes to the higher satisfaction in the hemithyroidectomy group. Similar trends have been noted in studies where hemithyroidectomy patients had shorter recovery times and fewer postoperative interventions compared to total thyroidectomy patients (14,17). In particular, the lower rate of postoperative complications in HT patients, such as bleeding and hypocalcemia, facilitates faster discharge and quicker recovery, factors that are highly valued by patients (14). This study highlights the importance of individualized treatment plans for papillary thyroid carcinoma management. Total thyroidectomy, while associated with lower recurrence rates, increases the risk of complications like hypocalcemia, negatively impacting patient satisfaction and long-term quality of life.

***Limitations of The Study***

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, this study demonstrates that hemithyroidectomy (HT) and total thyroidectomy (TT) are both viable surgical options for treating papillary thyroid carcinoma (PTC), each with distinct advantages. Hemithyroidectomy is associated with shorter operative times, fewer intraoperative complications, a shorter hospital stay, and lower rates of hypocalcemia, making it an attractive option for low-risk patients. However, the recurrence rate was slightly higher in the HT group, although the long-term survival outcomes were not significantly different between the two groups. Total thyroidectomy, while associated with a lower recurrence rate, poses a greater risk for complications, particularly persistent hypocalcemia. Overall patient satisfaction was high in both groups, but slightly higher in the hemithyroidectomy group, reflecting the importance of individualized treatment strategies. These findings underscore the need for personalized treatment approaches based on patient risk profiles, tumor characteristics, and clinical guidelines to optimize surgical outcomes and patient quality of life.

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***Ethical approval:*** The study was approved by the Institutional Ethics Committee

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