

# Hypothyroidism After Hemithyroidectomy: Frequency and Risk Factors in a Tertiary Level Hospital, Bangladesh

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## Abstract

**Background:** Hemithyroidectomy or lobectomy is widely used among the other modalities of thyroid surgery. Remaining thyroid tissue after hemithyroidectomy is thought to be sufficient enough to keep the patients in euthyroid status. Hypothyroidism is a common sequela of hemithyroidectomy. The incidence and risk factors for hypothyroidism after hemithyroidectomy remains unclear. As more patients undergo hemithyroidectomy in different indications, the chance of development of post hemithyroidectomy hypothyroidism is becoming a major concern. The aim of this study is to evaluate the incidence of post-operative hypothyroidism among patients who underwent hemithyroidectomy and identify related risk factors. **Objectives:** To find out the incidence and risk factors of hypothyroidism after hemi-thyroidectomy in a tertiary level hospital. **Methods:** This is a cross sectional study. The sample size was 60. All patients were selected according to the eligibility criteria by purposive sampling. Patients were analyzed for age, sex, family history of thyroid disease, FNAC report, pre and postoperative thyroid stimulating hormone (TSH), histologic diagnosis and histologic evidence of thyroiditis. Student t test, chi-square test were performed. Hypothyroidism was defined as thyroid stimulating hormone (TSH) level greater than 4.5  $\mu$ IU/L. **Results:** The highest patients (30%) were between 31 to 40 years of age and mean age was 38.79 ( $\pm$  9.15) years. The majority of the patients (72%) were female and Male and Female ratio 1:2.5. Only 8.4% patients had history of hypothyroidism preoperatively. After hemithyroidectomy, incidence of hypothyroidism was 15% among 60 patients. Majority of the patients (88.3%) had a colloid goitre, 8.4% patients had adenoma and only 3.33% patients had thyroiditis. The mean of the TSH were: preoperative (1.76  $\pm$  0.68), 6 weeks of operation (2.62  $\pm$  1.6) and After 6 months of operation (2.67  $\pm$  1.8). Raised preoperative TSH level ( $p < 0.001$ ) and Preoperative thyroiditis ( $p < 0.001$ ) were risk factors to developed post hemithyroidectomy hypothyroidism. Age ( $p = 0.086$ ), Sex ( $p = 0.37$ ) and family history ( $p = 0.84$ ) were not found significant as risk factors. **Conclusion:** Fifteen percent of patients in present study developed hypothyroidism after hemithyroidectomy. Preoperative TSH more than or equal 2.0 micro IU/L and lymphocytic infiltration or thyroiditis warrant post-operative close TSH monitoring. Awareness of such risk factors for post-operative hypothyroidism would improve patient care and reduced complications.

**Keywords:** Hemithyroidectomy, Hypothyroidism, Risk factors.

Date of Submission: 19-08-2024

Date of Acceptance: 29-08-2024

## I. Introduction

Thyroid is an essential endocrine gland of human body which is responsible for normal growth, development and metabolism [1]. Insufficient production and secretion of thyroid hormones causes hypothyroidism. This might be due to disturbance within the thyroid gland itself (primary hypothyroidism) or within the hypothalamic-pituitary-thyroid axis (secondary hypothyroidism). The operation of hemithyroidectomy (total thyroid lobectomy and isthmusectomy with preservation of the contralateral lobe) indicates for patients with a unilateral thyroid mass that is causing compressive symptoms, cosmetic concern or to exclude thyroid malignancies [2]. The development of hypothyroidism following hemithyroidectomy is a known complication of thyroid surgery. It reportedly develops in 5.6–48.9% of patients who undergo hemithyroidectomy [3]. Other common complications of hemithyroidectomy are laryngeal nerve injury, postoperative bleeding and wound infection. Hypothyroidism in post-hemithyroidectomy can either be subclinical (high TSH with normal free T4/T3) or clinical (low free T4 and T3 with high TSH). There is a much higher incidence of subclinical compared

to clinical hypothyroidism [4]. Thyroid hormone deficiency affects nearly all organs and functions in the human body [5]. The changes induced by hypothyroidism include the slowing and lowering of processes, which may mimic the alterations associated with aging. Symptoms and signs of hypothyroidism differ according to the severity and duration of the thyroid deficiency, the age of the patient and the occurrence of other systemic diseases. Postoperative hypothyroidism after hemithyroidectomy remains unpredictable. Early symptoms of hypothyroidism can be sleepiness, fatigue, and weight gain. PH is treated with L-thyroxine, which can also lead to arrhythmias, osteopenia, and osteoporosis [6]. The incidence and risk of hypothyroidism in patients undergoing hemithyroidectomy remains unclear. Several studies about thyroid function after hemithyroidectomy for benign thyroid disease have been published. Due to variation of time on development of hypothyroidism following hemithyroidectomy showed different follow-up interval after surgery. These variations sometimes confused physicians about uniform diagnostic criteria and treatment plan of postoperative hypothyroidism as well as greater risk group patient who need long term treatment. However, this study has evaluated the incidence of hypothyroidism in patients undergoing hemithyroidectomy and tried to review postoperative thyroid hormone replacement. Associated potential risk factors for the development of hypothyroidism following hemithyroidectomy was also tried to find out. Another aim of the study was to suggest a uniform monitoring and follow up protocol for all the patients after hemithyroidectomy for benign thyroid diseases.

## II. Methods & Materials

**Study design:** This was a cross sectional study to find out the prevalence of hypothyroidism after hemithyroidectomy in Bangladesh.

**Study population:** All case of benign thyroid diseases who got admitted for hemithyroidectomy operation during study period.

**Place of study:** The study was conducted in department of Otolaryngology- Head & Neck Surgery in Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh.

**Study period:** A cross sectional study was continued over a period of one and half years from September 2020 to February 2022. It was started with the selection of area of research and then research topic was selected through literature review. After topic selection research protocol was prepared from literature review. Planning and design, questionnaire development, pre-testing of questionnaire, data collection, extracting, entry, analysis of data and report writing were done within this period.

**Sampling technique:** Non probability consecutive sampling was used for data collection. Respondents were informed about various aspects related questionnaire and research objectives.

**Sample size:** Statistically the formula is used to calculate the sample size. So, estimated total sample was 65.

### **Selection Criteria:**

#### **Inclusion Criteria:**

1. Patients with all ages and both sexes admitted for hemithyroidectomy during study period.
2. Patients having benign thyroid disease involving single lobe.
3. Hemithyroidectomy done in the study period and attended for follow up accordingly upto 6 months.

#### **Exclusion Criteria:**

1. Patients administered thyroxine or antithyroid drug preoperatively.
2. All thyroid malignant case.
3. Patient who had previous history of thyroid surgery.
4. Respondents who are not willing to participate.

**Data collection technique:** Semi structured questionnaire was prepared and pre-tested was done and modified accordingly. The study participants were explained about the study and written informed consent was obtained. Face to face interview were done by the researchers using semi structured questionnaire among the population who fulfill the selection criteria. All patients were underwent thyroid examination followed by thyroid profile examination prior to surgery. Thyroid profiles investigation was repeated following hemi-thyroidectomy after 6 weeks and again after 6 months following surgery. The results of all these 2 thyroid profile results was tabulated and analyzed.

**Data collection tools:** On the basis of objective and variables of study, a semi structured questionnaire was prepared. Questionnaire was checked by Department of ENT, Dhaka Medical College Hospital before collecting the data and designed according to the objectives to get the information of different variables. The questionnaire initially developed in the English, and then it was translated into Bangla then was retranslated back into English by third person. The questionnaire was developed by following research tools based on two sections; Section 1: socio-demographic details such as age, sex, education, monthly income, occupation and educational level; Section 2: Clinical examinations and investigation related questions. Ages of the respondents was taken in completed years. Average monthly family expenditure was taken in taka.

**Data analysis plan:**

**Data entry:** After collection of data from the respondents, all data were checked and made entry in SPSS software. All data input were done with proper caution.

**Data Cleaning:** After completing entry of data in software, cleaning was done in order find out the error of input or any data missing during entry.

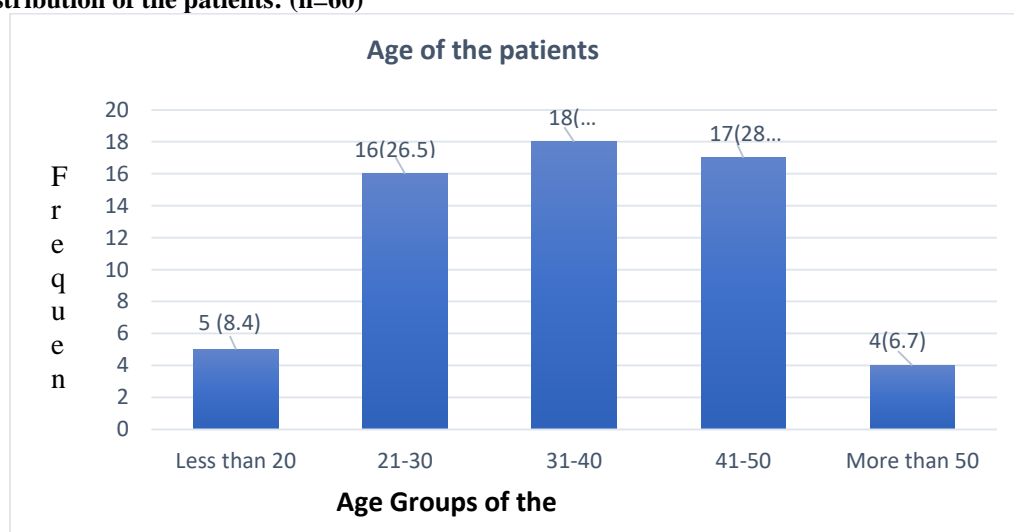
**Presentation and interpretation:**

All data were analyzed after through the checking, cleaning, editing and compiling by the 25th version of SPSS. Descriptive statistics were done first; frequency tables and figures will present accordingly. Inferential analysis was done by chi-square test, t-test and logistic correlation technique.

**III. Results**

This cross-sectional study was conducted to find out the incidence and risk factors of hypothyroidism after hemi-thyroidectomy in a tertiary level hospital. The study was conducted in department of ENT in Dhaka Medical College Hospital (DMCH). After calculation of sample size total sample size was 65, but due to loss of follow up 5 patients were excluded from the study. So total sample size was 60.

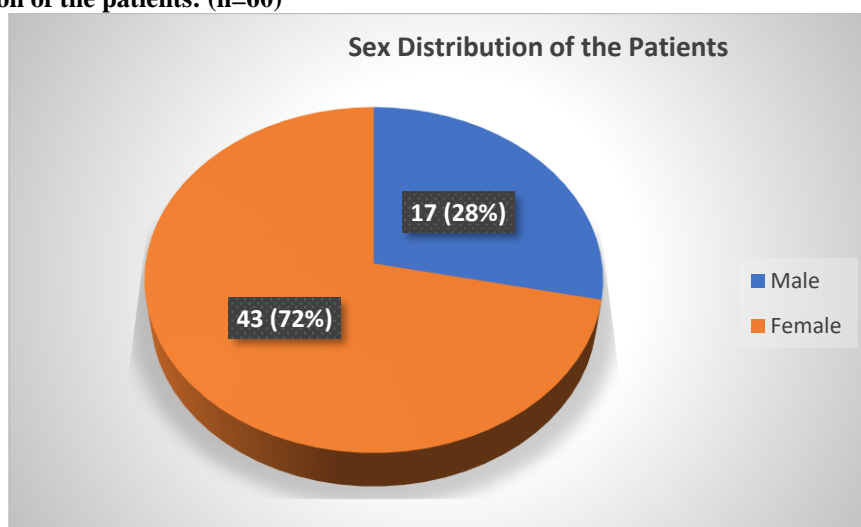
**Age distribution of the patients: (n=60)**



**Figure 1: Age distribution of the patients: (n=60)**

The highest patients (30%) were from 31 to 40 years of age followed by 28.4% patients came from 41-50 years of age group. A few patients (6.7%) were more than 50 years of age. The mean age was 38.79 ( $\pm$  9.15) Years.

**Sex distribution of the patients: (n=60)**



**Figure 2: Sex distribution of the patients: (n=60)**

The pie chart shows that the majority of the patients (72%) were female when data of the patients were collected. Male and Female ratio 1:2.5.

**Preoperative TSH level: (n=60)**

The table showed that, preoperatively 11.67% of the patients had TSH level more than 2.0  $\mu$ IU/L. But majority of the patient's (88.33%) TSH level was below 2.0  $\mu$ IU/L preoperatively.

**Table 1: Preoperative TSH level: (n=60)**

TSH Level	Frequency	Percentage (%)
>2.0 $\mu$ IU/L	7	11.67
<2.0 $\mu$ IU/L	53	88.33
Total	60	100

**Hypothyroidism after Hemithyroidectomy: (n=60)**

After hemithyroidectomy, only 9 (15%) patients were developed hypothyroidism among 60 patients. Majority of the patients (85%) did not developed hypothyroidism rather they were in euthyroid state according to biochemical reports upto 6 months.

**Table 2: Hypothyroidism after Hemithyroidectomy: (n=60)**

Hypothyroidism	Frequency	Percentage (%)
Present (TSH> 4.5 $\mu$ IU/L)	9	15.0
Absent (TSH< 4.5 $\mu$ IU/L)	51	85.0
Total	60	100

**FNAC finding: (n=60)**

In this study, majority of the patients (88.3%) had Colloidal goitre, 8.4% patients had adenoma and only 3.33% patients had thyroiditis.

**Table 3: FNAC finding: (n=60)**

FNAC	Frequency	Percentage (%)
Colloidal goitre	53	88.3
Adenoma	5	8.4
Thyroiditis	2	3.33
Total	60	100

**TSH level comparison: (n=60)**

In this study, two follow up TSH were done in 6 weeks and 6 months of hemithyroidectomy. The mean of the preoperative TSH was  $1.76 \pm 0.68 \mu\text{IU/L}$ . and after 6 weeks of operation mean was  $2.62 \pm 1.6 \mu\text{IU/L}$ . To see the difference between means, t-test was done and it was statistically significant ( $p = 0.023$ ). After 6 months of operation, the mean TSH was  $2.67 \pm 1.8 \mu\text{IU/L}$ . To see the difference between mean t-test was done and it was statistically significant ( $p = 0.014$ ).

**Table 4: TSH level comparison: (n=60)**

	Preoperative Mean( $\pm$ SD)	After 6 weeks Mean( $\pm$ SD)	P value
TSH	$1.76 \pm 0.68$	$2.62 \pm 1.6$	0.023

	Preoperative Mean( $\pm$ SD)	After 6 months Mean( $\pm$ SD)	P value
TSH	$1.76 \pm 0.68$	$2.67 \pm 1.8$	0.014

**Association of age, sex and family history of the patients with postoperative thyroid status: (n=60)**

After hemithyroidectomy, 6.6% of the patients less than 40 years develop hypothyroidism but After 40 years of age 8.4% of the patients develop hypothyroidism. To see the association between age and development of hypothyroidism chi-square test was done and it was insignificant ( $p=0.086$ ).

After hemithyroidectomy, 13.6% of the female patients developed hypothyroidism but only 1.6% of the patients develop hypothyroidism. To see the association between sex and development of hypothyroidism chi-square test was done and it was insignificant ( $p=0.37$ ).

In this study, only 1.6% of the patient developed hypothyroidism after hemithyroidectomy who had positive family history. To see the association between family history and development of hypothyroidism chi-square test was done and it was insignificant ( $p=0.84$ ).

**Table 5: Association of age, sex and family history of the patients with postoperative thyroid status: (n=60)**

Age (Years)	Euthyroid (n=51)	Hypothyroid (n=9)	P value
Less than 40	35 (58.3)	4 (6.6)	0.086
More than 40	16 (26.7)	5 (8.4)	
<b>Sex</b>			
Male	16 (26.5)	1 (1.6)	0.37
Female	35 (58.3)	8 (13.6)	
<b>Family History</b>			
Present	1 (1.6)	1 (1.6)	0.84
Absent	50 (83.4)	8 (13.6)	

**Association of preoperative TSH level with postoperative hypothyroidism: (n=60)**

In this study, it was observed that 55.55% of patients who developed hypothyroidism postoperatively had TSH level more than  $2.0 \mu\text{IU/L}$  preoperatively. To see the association between preoperative TSH level and development of postoperative hypothyroidism chi-square test was done and it was significant ( $p<0.001$ ).

**Table 6: Association of preoperative TSH level with postoperative hypothyroidism: (n=60)**

Preoperative TSH level	Euthyroid (n=51)	Hypothyroid (n=9)	P value
$>2.0 \mu\text{IU/L}$	2 (3.9)	5 (55.55)	$<0.001$
$<2.0 \mu\text{IU/L}$	49 (96.1)	4 (44.44)	
Total	51 (100)	9 (100)	

**Association of preoperative thyroiditis with postoperative hypothyroidism: (n=60)**

In this study, it was shown that 22.22% had preoperative thyroiditis in hypothyroid group and no history of preoperative thyroiditis in euthyroid group. To see the association between preoperative thyroiditis and development of postoperative hypothyroidism chi-square test was done and it was significant ( $p<0.001$ ).

**Table 7: Association of preoperative thyroiditis with postoperative hypothyroidism: (n=60)**

Thyroiditis	Euthyroid (n=51)	Hypothyroid (n=9)	P value
Present	0 (0)	2 (22.22)	<0.001
Absent	51 (100)	7 (77.78)	
Total	51 (100)	9 (100)	

**Correlation with pre-operative and post-operative TSH level: (n=60)**

In this study regarding correlation between preoperative TSH level and postoperative TSH level it is observed that significant positive correlation between after 6 weeks and positive correlation with after 6 months.

**Table 8: Correlation with pre-operative and post-operative TSH level: (n=60)**

TSH Level		Coefficient value r	P value
Pre-operative	6 weeks	+ 0.49	<0.001
Pre-operative	6 months	+ 0.53	<0.001

**IV. Discussion**

The current cross-sectional study was conducted at Department of ENT & Head-Neck Surgery in Dhaka Medical College Hospital (DMCH). The study was done in patients who admitted in Dhaka Medical College Hospital for hemi-thyroidectomy during the period of 1 and one and half month from September, 2020 to February, 2022. A total of 65 patients of any age and sex were selected fulfilling the inclusion and exclusion criteria. But 5 patients were excluded due to loss of follow-up. The present study findings were discussed and compared with previously published relevant studies. The highest patients (30%) were from 31 to 40 years of age followed by 28.4% patients came from 41-50 years of age group. The mean age was 38.79 ( $\pm$  9.15) Years. This result was quite similar to the study as Ikbal, A. et al [2] and Chotigavanich, C. et al [7]. Ikbal, A. et al [2] showed that mean age of the patients were 38 years, whereas Chotigavanich, C. et al [7] showed that mean age was 43.6 $\pm$ 12.2 years. Both results were within the range of this study. The majority of the patients (72%) were female. The same results were shown by Awual, S.A. et al, Chong, S.S. et al and Li, Z. et al [4,8,9]. All these studies showed that female was the preminant sex for hemi thyroidectomy operation. In this study the family history of the sample is observed that only 3 (5.0%) patients had positive family history of hypothyroidism. Ikbal, A. et al [2] and Awual, S.A. et al [8] showed that very few patients had family history of hypothyroidism. The table showed that, preoperatively 11.7% of the patients had TSH level more than 2.2  $\mu$ IU/L. But majority of the patient's (88.33%) TSH level was below 2.0  $\mu$ IU/L preoperatively. After hemithyroidectomy, only 9 (15%) patients were developed hypothyroidism among 60 patients. Majority of the patients (85%) did not developed hypothyroidism rather they were in euthyroid state according to biochemical reports upto 6 months. Awual, S.A. et al [8] showed that the overall prevalence of post hemithyroidectomy hypothyroidism in the study was 10 (22.22%). Chotigavanich, C. et al [7] showed that prevalence of post hemithyroidectomy hypothyroidism in the study was 27%. Awual, S.A. et [8] showed in their study that the prevalence of hypothyroidism after thyroidectomy was 22%. Chong, S.S. et al [4] also showed that the prevalence was 22.5%. But Ahn, D. et al [3] showed a very different results from these studied. They showed that 55% patients developed hypothyroidism after hemithyroidectomy operation. Said, M. et al [10] also showed that the prevalence of developing hypothyroidism was 32%. Johner et al, [11] reported that the overall incidence of early postoperative hypothyroidism was 21.6%, with the incidence of permanent hypothyroidism only 7.8%. On FNAC findings, majority of the patients (88.0%) had colloid goitre, 8.4% patients had adenoma and only 1.6% patients had thyroiditis in this study. Al-Shalhoub, A.K. et al [12] showed that majority of the patient shad multinodular goiter followed by adenoma. Also showed that majority of the patients had colloidal and Multinodular goiter followed by adenoma on histopathological test [2]. Beisa, V. et al [6] showed similar FNAC result. Chong, S.S., et al [4] and Lee, S.J. et al [13] also showed the similar findings like this study. In this study, two follow up TSH were done in 6 weeks and 6 months of hemithyroidectomy. The mean of the preoperative TSH was 1.76  $\pm$  0.68  $\mu$ IU/L. and after 6 weeks of operation mean was 2.62  $\pm$  1.6  $\mu$ IU/L. To see the difference between means, t-test was done and it was statistically significant (p = 0.023). After 6 months of operation, the mean TSH was 2.67  $\pm$  1.8  $\mu$ IU/L. To see the difference between mean t-test was done and it was statistically significant (p = 0.014). Chotigavanich, C., et al [7] showed that mean preoperative TSH level was significantly higher in the hypothyroid group (1.9 $\pm$ 1.2 micro IU/l) compared to the euthyroid group (1.1 $\pm$ 0.7 micro IU/l) with p<0.001 and post operatively TSH level was also significantly higher in the hypothyroid group (7.0 $\pm$ 3.2 micro IU/l) compared to the euthyroid group (2.2 $\pm$ 1.0 micro IU/l) with p<0.001. In a study done by Beisa, V. et al [6] reveals that preoperative TSH level was significantly higher in the hypothyroid group (01.42 $\pm$ 0.67 micro IU/l) compared to the euthyroid group (0.85 $\pm$ 4.6 micro IU/l) with p<0.001 and post operatively TSH level was also significantly higher in the hypothyroid group

( $4.4 \pm 0.9$  micro IU/l) compared to the euthyroid group ( $2.4 \pm 0.88$ ) micro IU/l) with  $p < 0.001$ . On assessing the risk factors, age, sex and family history was considered. After hemithyroidectomy, 6.6% of the patients less than 40 year develop hypothyroidism but After 40 year of age 8.4% of the patients develop hypothyroidism after hemithyroidectomy. To see the association between age and development of hypothyroidism chi-square test was done and it was insignificant ( $p = 0.086$ ). That means though, age was not statistically significant as a risk factor but according to the percentage chances of developing hypothyroidism was slightly more in older ages. Ikbal, A., et al [2] Chotigavanich, C., et al [7] and Barka, I. et al [14], showed in their studies that age was not associated with developing hypothyroidism after hemithyroidectomy, but all these studies indicate that older age had suffered more than younger ages. But Ahn, D. et al [3] showed that more than 46 years old patients had significant association with developing hypothyroidism after hemithyroidectomy. Sex was another demographic factor. Female are more prone to develop thyroid diseases. After hemithyroidectomy, 13.6% of the female patients developed hypothyroidism but only 1.6% of the patients develop hypothyroidism after hemithyroidectomy. To see the association between sex and development of hypothyroidism chi-square test was done and it was insignificant ( $p = 0.37$ ). Ahn, D. et al [3], Chong, S.S. et al [4], Li, Z et al [9] and Said, M. et al [10] showed in their study that though female sex was more prone to develop thyroid diseases but it is not statistically significant as a risk factor to develop hypothyroidism after hemithyroidectomy. In this study, only 1.6% of the patient developed hypothyroidism after hemithyroidectomy who had positive family history. To see the association between family history and development of hypothyroidism chi-square test was done and it was insignificant ( $p = 0.84$ ). Ikbal, A et al [2] showed that family history was not associated with developing hypothyroidism after hemithyroidectomy. Ahn, D. et al [3] also showed the similar results. In this study, it was observed that 55.55% of patients who developed hypothyroidism postoperatively had TSH level more than  $2.0 \mu\text{IU/L}$  preoperatively. To see the association between preoperative TSH level and development of postoperative hypothyroidism chi-square test was done and it was significant ( $p < 0.001$ ). Regarding correlation between preoperative TSH level and postoperative TSH level it is observed that significant positive correlation between after 6 weeks and positive correlation with after 6 months. That means increased preoperative serum TSH level had moderately related to postoperative increased serum TSH level. Barka, I. et al [14] also showed that the incidence of hypothyroidism significantly correlated with higher preoperative serum TSH level. In this study, it was shown that 22.22% had preoperative thyroiditis in hypothyroid group and no history of preoperative thyroiditis in euthyroid group. To see the association between preoperative thyroiditis and development of postoperative hypothyroidism chi-square test was done and it was significant ( $p < 0.001$ ). Said, M. et al [10] also shows that preoperative thyroiditis was a potential risk factor to develop postoperative hypothyroidism. Vaiman, M. et al [15] also showed the similar results. In this study the follow-up schedule was at 6 weeks and 6 months after surgery, recommended yearly thereafter. The incidence of 15% had been quite similar to various studies. Preoperative raised TSH level more than  $2.0 \mu\text{IU/L}$  and preoperative thyroiditis were the most important risk factor to develop hypothyroidism postoperatively. Age, sex or familiar history of hypothyroidism were not associated with developing postoperative hypothyroidism. Though there are some limitations of this study like short sample size and short term follow up period, the findings obtained from this study will definitely guide surgeons to take decisions about post hemithyroidectomy hypothyroidism and can avoid hypothyroidism related post-operative hazards.

## V. Conclusion

The frequency of hypothyroidism following hemithyroidectomy is fifteen percent which is comparatively lower than published series. However, it was not possible to determine exactly when hypothyroidism developed post-surgery, because follow up was taken only 2 times during 6 months course. In this study, raised preoperative TSH level and Preoperative thyroiditis had a significant association in development of hypothyroidism. Further studies with more precise postoperative TSH and preoperative thyroid antibody test are needed to define the risk factors.

## VI. Limitations

1. In this study, postoperative follow-up period was only 6 (six) months. An argument could be made that at least some of the patients in the euthyroid group might have eventually become hypothyroid.
2. Serum TSH levels were not drawn from all patients at regular intervals, it was not possibly known if some of the euthyroid patients who were not followed as often eventually would have become hypothyroid.
3. Individual information on iodine deficiency was not measured, which may be associated with the development of hypothyroidism.
4. Small sample size.

## VII. Recommendations

1. Routine postoperative TSH monitoring for all patients but patients with raised preoperative TSH level, histologic evidence of thyroiditis or elevated thyroid antibody levels represent a high-risk group and should be flagged for more intensive follow up were recommended.
2. Prospective studies are required to identify the incidence as well as to establish the potentially associated risk factors in the prediction of hypothyroidism after hemithyroidectomy on the large number of patient of benign thyroid diseases in a cohort study in our country.
3. Longer period of follow up may change the outcome.
4. Multicentred study may be done.

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