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Original Research Article

A clinico – pathological study of patients undergoing thyroidectomy in a rural tertiary care center of northern Kerala

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ABSTRACT

Aims & Objectives: The aim of the study is to assess the clinical profile of patients undergoing thyroidectomy and to determine its association with FNAC (fine needle aspiration cytology) and histopathological report; and to compile a statistical data on the percentage of various malignancies and benign conditions of thyroid in patients undergoing thyroidectomy.

Materials and Methods: This was a prospective study conducted in a rural tertiary care centre among the patients undergoing thyroidectomy. Minimum sample size was estimated to be 110. Convenience sampling technique was adopted and data was collected using pretested semi-structured questionnaire with the help of interviews, clinical examinations and investigation reports. Data was analyzed using SPSS trial v25.

Results: Mean age of those who underwent thyroidectomy was 44.81 years. 96% were females. Most common clinical diagnosis was multinodular goiter (80%). Malignancies constituted 4%. Most common diagnosis as per FNAC was Colloid goiter (73%). There was statistically significant association of clinical diagnosis with, FNAC findings and with postoperative histopathological examination. As per the present study, efficacy of FNAC to differentiate malignant lesions was 100%.

Conclusion: Most common malignancies were: Papillary Ca and Follicular Ca. Among benign lesions, colloid goiter was most common. Clinically, 4% thyroid cases were identified as malignancies, which were consistent with findings of FNAC and post-operative HPE reports. With efficacy of 100% in the present study, FNAC stands as an important premanagement investigation; hence the study recommends FNAC mandatorily with or without other investigation such as radiological features.

1. Introduction

Thyroid is an important endocrine gland in the body with a wide range of physiological and pathological changes.[1] thyroid gland when exposed to various environmental and pathological factors may have various changes to itself which may be inflammatory, hyperplastic or neoplastic.[2] Most of these present as thyroid swelling; and this presentation is commonly encountered by clinicians, especially surgeons.[3]

Thyroid malignancy is the most common endocrine malignancy in the world.[4] Most other benign conditions may be managed with non-surgical care. And in parallel with the use of radiological instruments the incidence of thyroid nodules has significantly increased.[5]Hence to decide on the need of surgery, preliminary investigations play a major role, especially in distinguishing benign from malignant lesions.[3] There are three commonly done investigations and they are: Ultrasonography (USG), Fine needle aspiration cytology (FNAC) and Thyroid function test (TFT).

USG neck is an important imaging modality used to distinguish malignant and benign swellings but when used

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indiscriminately they can produce results on insignificant swelling.[5]

FNAC is an effective first line investigation in thyroid swelling[6] and Thyroid function test (TFT) is an important tool in evaluating a thyroid nodule. To comment on the disease burden, thyroid nodules have been described on neck palpation estimated at 4 to 7 % of normal population and 30% to 50 % in people with iodine deficiency.[7] Incidence of thyroid cancer has been elevated between 1973 and 2002 in most populations throughout the world. It has increased by 48% in males and 66.7% in females.[8]

Over a decade, incidence rate of thyroid cancer in India in women has increased from 2.4 [95% confidence interval {CI}: 2.2 – 2.7] to 3.9 [95% CI: 3.6 – 4.2] and in men from 0.9 (95% CI: 0.8 – 1.1) to 1.3 (95% CI: 1.2 – 1.5) with a relative increase of 62% and 48% respectively,[9] while frequency of the thyroid malignancy has been reported at 0.9% to 13% from different parts of the world.[10] Differentiated thyroid cancer is more frequent in young adults, ratio of females to males is 2:1.[11] Thyroid disorders represent a spectrum of different histologic entities with few distinct, some overlapping clinical behaviours. The clinical evaluation of thyroid lesion is a common problem confronting the clinicians.

2. Objective

To evaluate the thyroid disease in patients undergoing thyroidectomy and co relate with the pathological diagnosis of the patient post and pre thyroidectomy and compile a statistical data on the patients undergoing thyroidectomy on various parameters like sex, age, type of surgery, complications and other parameters.

3. Materials and Methods

This is a prospective observational study design,[12] adopted with all the patients undergoing thyroidectomy constituting the study population. Non-probability sampling technique i.e. convenience sampling[12] was used. All the patients undergoing thyroidectomy was considered and only those patients who were not fit for thyroidectomy or those who were not giving proper consent were excluded from the study thus forming the inclusion and exclusion criteria. Using the data from the study conducted by Behan RB et al.[13] minimum sample size required for the study was calculated using the formula.

$$n = \frac{4pq}{d^2}$$

n = 83.38 ≅ 84

The calculated minimum sample has been inflated by 30% to account for anticipated subject non-response hence the study was conducted with a sample size of 113 subjects.

4. Results

A total of 113 patients were surveyed for the present study. The analysis is summarized as below.

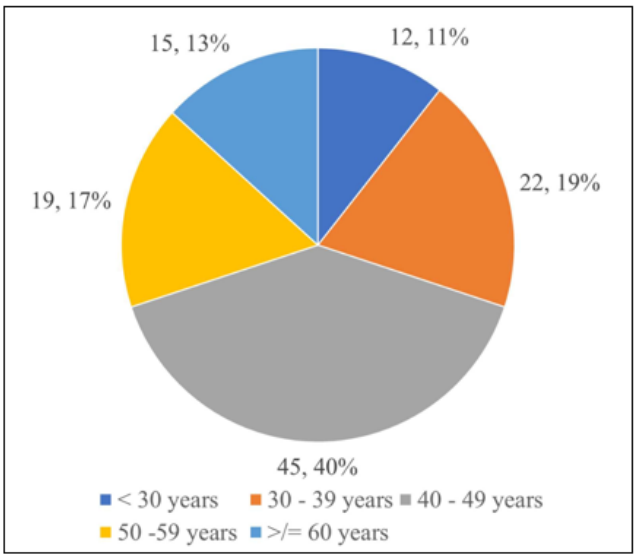

Fig. 1: Age distribution of study participants: Pie-chart

Almost 40% individuals belonged to the age group of 40 to 49 years, with mean (SD) age of 44.81 years (12.59 years). Around 19% individuals belonged to age group of 30 – 39 years, followed by 17% individuals belonging to 50 – 59 years. Proportion of patients less than 30 years who underwent thyroidectomy was 13% while those with age less than 30 years were 11% only.

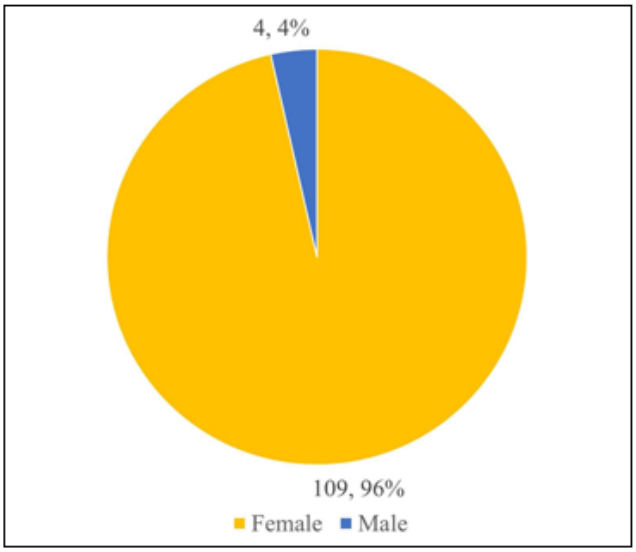

Fig. 2: Gender distribution of study participants: Pie-chart

According to above pie chart, almost all patients who underwent thyroidectomy were females i.e. 96% of the

study samples were females. Only remaining 4% patients were males.

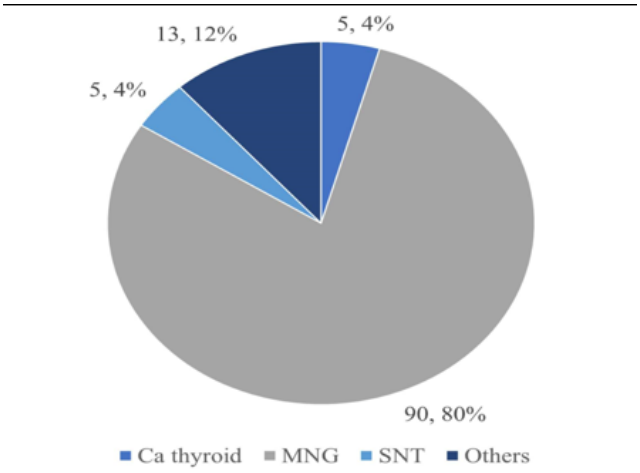

Fig. 3: Clinical diagnosis of thyroid swellings of study participants: Pie-chart (Indications of thyroidectomy in the present study)

Most of the patients who underwent thyroidectomy were clinically diagnosed to have MNG i.e. 80% patients had multinodular goiter. Another 12% patients had diffuse Thyroid swelling. Other than this, 5 patients (i.e. 4%) were suspected to have malignant changes and another 5 patients (i.e. 4%) had solitary thyroid nodule.

Table 1: Clinical diagnosis of study participants as per different age categories

Age categories	Clinical diagnosis			
	MNG	SNT	Ca Thyroid	Diffuse goiter
< 30 years	10 (83.3%)	1 (8.3%)	1 (8.3%)	0
30 – 39 years	18 (81.8%)	1 (4.5%)	3 (13.6%)	0
40 – 49 years	39 (86.7%)	3 (6.7%)	0	3 (6.7%)
50 – 59 years	14 (73.7%)	4 (21.1%)	1 (5.3%)	4 (21.1%)
≥ 60 years	9 (60.0%)	6 (40.0%)	0	6 (40.0%)
χ^2: 27.79; df: 12; p value: 0.006*				

*p value significant at 0.05

Proportions of individual with MNG in individuals with < 30 years, 30-39 years, 40-49 years, 50-59 years and ≥ 60 years are 83%, 82%, 87%, 74% and 60% respectively. In individuals less than 40 years of age, diffuse goiter is not seen while that in the age group categories of 40-49 years, 50-59 years and ≥ 60 years are 7%, 21% and 40% respectively. These differences in proportions are statistically significant i.e. there is significant association between age categories and different clinical diagnoses.

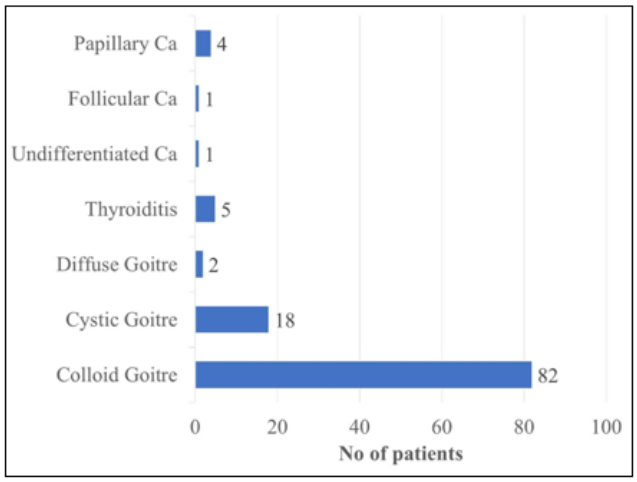

Fig. 4: Pre-operative pathological diagnosis (FNAC) of thyroid swellings of study participants: Bar-chart

Most common HPE diagnosis was colloid goiter, which was seen in 82 out of 113 patients, constituting 73%. Next most common HPE diagnosis was cystic goiter, which was seen in 18 out of 113 patients, constituting 16%. Other diagnoses of varying composition (1% to 4%) were: Carcinoma, Thyroiditis, Diffuse goiter etc.

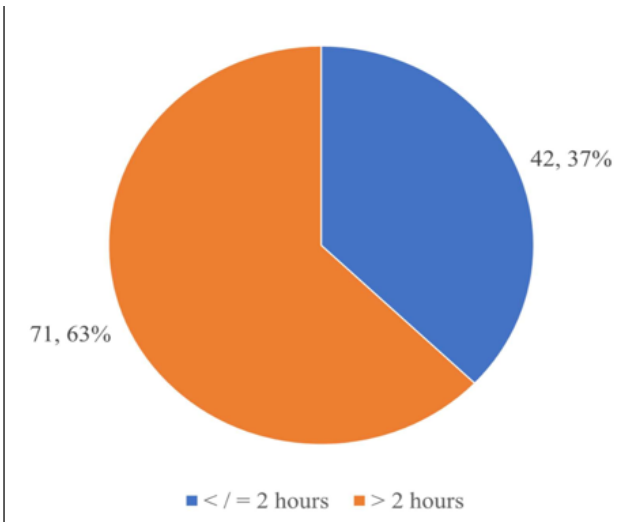

Fig. 5: Duration of thyroidectomy of study participants: Pie-chart

The total duration ranged from 105 minutes to 225 minutes. Mean (Standard deviation) duration of the surgery was 140.44 minutes (27.87 minutes). The surgery duration was categorized into two groups: i.e. 2 hours or below and more than 2 hours of total duration. More number of patients i.e. 71 out of 113 patients constituting 63% patients' thyroidectomy surgery went on for more than 2 hours.

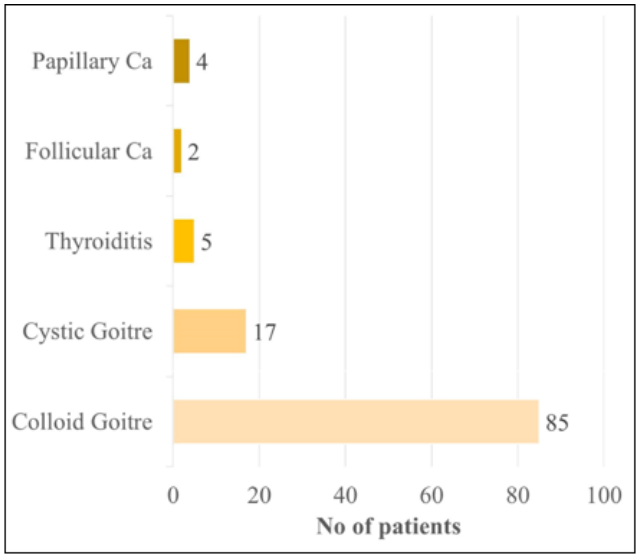

Fig. 6: Post-operative histopathological diagnosis of thyroid swellings of study participants: Pie-chart

Most common HPE diagnosis post-operatively was colloid goiter, which was seen in 85 out of 113 patients, constituting 75%. Next most common HPE diagnosis was cystic goiter, which was seen in 17 out of 113 patients, constituting 15%. Other diagnoses of varying composition (2% to 4%) were: Follicular Carcinoma, Papillary Carcinoma and Thyroiditis.

Table 2: Association between clinical diagnosis and pre-operative histopathological examination

Pre-operative HPE	Clinical diagnosis			
	MNG	SNT	Diffuse goiter	Ca Thyroid
Colloid goitre	71 (78.9%)	4 (80.0%)	7 (53.8%)	0
Cystic lesion	17 (18.9%)	0	1 (7.7%)	0
Diffuse goiter	1 (1.1%)	1 (20.0%)	0	0
Thyroiditis	0	0	5 (38.5%)	0
Follicular Ca	0	0	0	1 (20.0%)
Papillary Ca	0	0	0	4 (80.0%)
Undifferentiated Ca	1 (1.1%)	0	0	0
Total	90 (100%)	5 (100%)	13 (100%)	5 (100%)

χ^2: 176.0; df: 18; p value: < 0.001*

*p value significant at 0.05

Among those individuals with Multinodular goiter, reported HPE diagnoses were colloid goiter (79%), Cystic lesion (19%) and carcinoma (1%).

Among those individuals with Solitary nodule of thyroid, reported HPE diagnoses were colloid goiter (80%), and diffuse goiter (20%).

Among those individuals with Diffuse goiter, reported HPE diagnoses were colloid goiter (54%), Cystic lesion (8%) and thyroiditis (39%). Among those individuals with carcinoma thyroid, reported HPE diagnoses were follicular carcinoma (20%) and papillary carcinoma (80%).

These differences in proportions are statistically significant i.e. there is significant association between different pre-operative histopathological diagnoses and different clinical diagnoses.

Table 3: Association between clinical diagnosis and post-operative histopathological examination

Post-operative HPE	Clinical diagnosis			
	MNG	SNT	Diffuse goiter	Ca Thyroid
Colloid goiter	75 (83.3%)	4 (80.0%)	6 (46.2%)	0
Cystic lesion	14 (15.6%)	1 (20.0%)	2 (15.4%)	0
Thyroiditis	0	0	5 (38.5%)	0
Follicular Ca	1 (1.1%)	0	0	1 (20.0%)
Papillary Ca	0	0	0	4 (80.0%)
Total	90 (100%)	5 (100%)	13 (100%)	5 (100%)

χ^2: 141.7; df: 12; p value: < 0.001*

*p value significant at 0.05

Among those individuals with Multinodular goiter, reported HPE diagnoses were colloid goiter (83%), Cystic lesion (16%) and follicular carcinoma (1%). Among those individuals with Solitary nodule of thyroid, reported HPE diagnoses were colloid goiter (80%), and Cystic goiter (20%). Among those individuals with Diffuse goiter, reported HPE diagnoses were colloid goiter (46%), Cystic lesion (15%) and thyroiditis (38.5%). Among those individuals with carcinoma thyroid, reported HPE diagnoses were follicular carcinoma (20%) and papillary carcinoma (80%).

These differences in proportions are statistically significant i.e. there is significant association between different post-operative histopathological diagnoses and different clinical diagnoses.

5. Discussion

The present study was planned to assess the indications of thyroidectomy, to study clinic-pathological features of thyroid lesions and to determine correlations between findings of the investigation parameters i.e. TFT, USG, FNAC and HPE of the post-thyroidectomy specimen.

Table 4: Efficacy of pre-operative FNAC to diagnose malignancy of thyroid

Diagnosis as per FNAC	Diagnosis as per HPE		Total
	Malignant	Benign	
Malignant	6 (TP)	0 (FP)	6 (Test P)
Benign	0 (FN)	107 (TN)	107 (Test N)
Total	6 (Total P)	107 (Total N)	113

Sensitivity = Specificity = PPV = NPV =. 100%

A total of 113 patients who were selected after applying eligibility criteria were included for the study. Observations made are discussed as below objective-wise.

5.1. Age distribution

Table 5: Age distribution of patients undergoing thyroidectomy across various studies

Study / Author	Place	Year	Findings
Present study	Kerala	2022	40 to 49 years: 40%; Mean: 44.81 years
Alyaha KA et al.[14]	S. Arabia	2022	Mean: 45.9 years
Shukla S. et al.[15]	MP	2021	31 to 40 years: 37%; Mean: 35.9 years
Behan RB et al.[12]	Pakistan	2020	35-44 years: 43.1%
Harishwaran P et al.1[6]	Tamil Nadu	2020	31 to 40 years: 36%

Average age of patients undergoing thyroidectomy was 44.81 years in the present study which was comparable to average age of 45.9 years in a study conducted by Alyaha KA et al.[14] in Saudi Arabia in 2022. In most other studies, average age of patients undergoing thyroidectomy was around 10 years lesser.

For example, mean age of patients in a study conducted by Shukla S. et al.[15] in 2021 in Madhya Pradesh, India was 35.9 years. Also, age-group category-wise, most common age group involved was 31 to 40 years in most studies (such as the study conducted by Shukla S. et al.[15] in 2021 in Madhya Pradesh and that conducted by Harishwaran P et al.[16] in 2020 in Tamil Nadu).

5.2. Gender distribution

In all the studies, most patients were females. Even the older literature approves this with an approximate female to male ratio of 5:1. Present study reports having around 96% as females. Also, the other studies conducted in similar timeline were observed to have high proportion of females among those patients who underwent thyroidectomy i.e. proportion of females were more than 80%.

Table 6: Gender distribution of patients undergoing thyroidectomy across various studies

Study / Author	Place	Year	Findings
Present study	Kerala	2022	Females: 96%
Alyaha KA et al.[14]	S. Arabia	2022	Females: 87.3%
Shukla S. et al.[15]	MP	2021	Females: 83.3%
Behan RB et al.[12]	Pakistan	2020	Females: 63.8%
Harishwaran P et al.[16]	Tamil Nadu	2020	Females: 82%

5.3. Indications for thyroidectomy

Most common underlying thyroid lesion which was the cause for thyroidectomy in the present study was Colloid, noted among three-fifth (~73%) of the patients. Proportion of patients with colloid nodules varied from 46% to 83% across various studies conducted almost in the same timeline as the present study.

Malignant lesions were the indication for thyroidectomy only for 5% patients in the present study, while it was more than 10% in most other studies such as the ones mentioned in the above table. Malignancy rate observed in the studies conducted by Harishwaran P et al.[16] in Tamil Nadu in 2020, Behan RB et al.[12] in Pakistan in 2020, Shukla S. et al.[15] in Madhya Pradesh in 2021, and Alyaha KA et al.[14] in Saudi Arabia in 2022 were 10%, 12%, 13% and 42% respectively.

The present study reports FNAC to be 100% sensitive, 100% specific with predictive values of 100% for both positive and negative test. Specificity and PPV of FNAC for detecting malignancy of thyroid was 100% as reported by most studies. This means that false negatives are very negligible for FNAC. However, the test may report positives falsely owing to varying sensitivity from 66% to 100%.

The study conducted by Babu S et al.[17] in Tamil Nadu in 2016 also reported 100% sensitivity, specificity and predictive values, just like the similar study. But the former was the test efficacy to detect follicular carcinoma alone.

6. Conclusion

Indication for thyroidectomy included both benign and malignant lesions. Most common malignancies were: Papillary Ca and Follicular Ca. Among benign lesions colloid goiter (73%) was most common. Other benign lesions were: Cystic lesion (16%), Thyroiditis (4%) diffuse goiter, etc.

Clinically, 4% thyroid cases were identified as malignancies, which were consistent with findings of FNAC and post –operative HPE reports.

Also with efficacy of 100% in the present study, FNAC stands as an important pre-management investigation; hence

Table 7: Indications for thyroidectomy across various studies

Study / Author	Place	Year	Findings				
			Ca	Colloid	Cystic	Thyroi -ditis	Others
Present study	Kerala	2022	5%	73%	16%	4%	2%
Alyaha KA et al.[14]	S. Arabia	2022	42%	46%			
Shukla S. et al.[15]	MP	2021	13%	49%		17%	
Behan RB et al.[12]	Pakistan	2020	12%	83%			5%
Harishwaran P et al.[16]	Tamil Nadu	2020	10%	72%	-	14%	4%

Table 8: Efficacy of pre-operative FNAC to diagnose malignancy of thyroid across various studies

Study / Author	Place	Year	Parameters of efficacy			
			Sn	Sp	PPV	NPV
Present study	Kerala	2022	100%	100%	100%	100%
Harishwaran P et al.[17]	TN	2020	71.4%	100%	100%	95.6%
Chaudhary M et al.[18]	MP	2019	92.3%	54.6%	87.8%	66.7%
Musa DH et al.[19]	Iraq	2019	66.7%	100%	100%	97.3%
Babu S et al.[20]	TN	2016	100%[#]	100%	100%	100%[#]

Sn: Sensitivity, Sp: Specificity, PPV: Positive predictive value, NPV: Negative Predictive Value; [#]: 100% for follicular carcinoma

the study recommends FNAC mandatorily with or without other investigations such as radiological features.

The current study was conducted in a population of 113 patients which is a major disadvantage comparing the scope of the study, this is the major limitation of this study.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

1. Hall JE, Hall ME. Guyton and hall textbook of medical physiology E-book. and others, editor. Elsevier Health Sciences; 2020. p. 1112.
2. Kumar V, Abbas AK, Aster J, Deyrup AT. Robbins Essential Pathology. 1st ed. and others, editor. Elsevier Health Sciences; 2020. p. 352.
3. Williams NS, Bulstrode C. Bailey and Love's Short Practice of Surgery. 26th ed. Great Britain; UK: Hodder Arnold Puplicatima; 2018. p. 1530.
4. Pellegriti G, Frasca F, Regalbuto C, Vigneri SS, Endocrine R. *Journal of cancer epidemiology*. 2013;p. 965212–965212.
5. Remonti L, Kramer C, Leitao CB, Catani L, Pinto F, Gross JI. Investigations of thyroid lesions. *Thyroid J*. 2015;5:25.
6. Sandini A, Wijesinghe D. Pathological features of thyroid diseases. *Int Clin Pathol J*. 2013;2:1–5.
7. Behan. Thyroid disorders and their management. *J Pharm Res*. 2020;32(6):96–101.
8. Kilfoy, Zeng T, Holfrod TR. international patterns and trends in thyroid cancer incidence. *Cancer Causes Cont*. 1973;20(5):525–31.
9. Veedu KS, Wong E, Huang A, Quanchen B. Semimonthly Versus Monthly Regimen of Fluorouracil and Leucovorin Administered for 24 or 36 Weeks as Adjuvant Therapy in Stage II and III Colon Cancer: Results of a Randomized Trial. *J Clinical Oncol*. 2003;21(15):2896–903.
10. Sachmechi T, Miller E, Varatharajah R, Chernys A, Carroll Z, Kissin E. thyroid carcinoma in single cold nodule and in the cold nodules of multinodular goiters. *Endocr Pract*. 2000;6(1):5–7.
11. National Family Health Survey - IV. Press information bureau; 2015. Available from: https://pib.gov.in/Pressreleaseshare.aspx?PRID=1847431.
12. Park K, editor. Nutrition and health; Textbook of preventive and social medicine. Jabalpur, India: Bhanot Publishers; 2021. p. 1–942.
13. Behan RB, Mohammed AT, Rasool B, Laghari MUR. Clinicohistopathological Assessment of Patients Undergoing Thyroidectomy. *J Pharm Res Int*. 2020;32(6):96–101.
14. Alyahya KA, Alarfaj AA, Alyahya AA, Alnaim AE. Indications and complications for surgical management of thyroid diseases: A single center experience. *Ann Med Surg*. 2022;79:103980.
15. Shukla S, Patel BP, Shukla S, Patel VK, Vaidya K, Rathore D. Clinicopathological study of thyroid swellings and it's correlation with ultrasonography. *Int Surg J*. 2021;8(4):1218.
16. Harishwaran P, Vikram G. A clinico pathological study and management of multinodular goitre. *Med Pulse Int J Surg*. 2020;13(2):51–6.
17. Babu SBK, Raju R, Radhakrishnan S. Correlation of fine needle aspiration cytology with histopathology in the diagnosis of thyroid swellings. *Int Surg J*. 2016;3:1437–78.

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