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Original Research Article

CORRELATION OF FINE NEEDLE ASPIRATION CYTOLOGY FINDINGS WITH THYROID PROFILE IN CASES OF LYMPHOCYTIC THYROIDITIS: A HOSPITAL BASED CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Lymphocytic thyroiditis is a common autoimmune thyroid disorder and a frequent cause of hypothyroidism. Fine-needle aspiration cytology (FNAC) plays a pivotal role in its diagnosis, while cytological grading has been proposed to assess disease severity. However, the correlation between cytological grades and biochemical, immunological, and radiological parameters remains variable. **Aims and Objectives:** To evaluate the cytomorphological features of lymphocytic thyroiditis on FNAC, to grade cases according to the criteria proposed by Bhatia et al., and to correlate cytological grades with thyroid hormonal status, Anti-thyroid peroxidase (Anti-TPO) antibody levels, and ultrasonographic findings. **Materials and Methods:** This hospital-based cross-sectional study was conducted in the Department of Pathology, Gandhi Medical College, Bhopal, from January 2024 to December 2024. A total of 45 patients diagnosed with lymphocytic thyroiditis on FNAC were included. Clinical details, thyroid function tests (fT3, fT4, TSH), Anti-TPO antibody levels, and ultrasonographic findings were recorded. FNAC smears were evaluated for characteristic cytological features and graded as Grade I, II, or III according to Bhatia et al. Correlation between cytological grades and biochemical, immunological, and radiological parameters was analysed using the Chi-square test, with a p-value <0.05 considered statistically significant. **Result:** The study population showed a marked female predominance (88%), with most patients belonging to the 20–40-year age group. Anterior neck swelling was the most common presenting complaint. Cytologically, all cases demonstrated follicular lymphocytic infiltration and background lymphocytes. Grade II lymphocytic thyroiditis was the most frequent cytological grade (65%). Biochemically, hypothyroidism was observed in 60% of cases, followed by euthyroid (31.11%) and hyperthyroid states (8.11%). Although hypothyroidism and elevated Anti-TPO antibody levels were more frequently observed in higher cytological grades, no statistically significant correlation was found between cytological grade and thyroid functional status, Anti-TPO antibody levels, or ultrasonographic findings ($p > 0.05$). **Conclusion:** FNAC remains a reliable and cost-effective diagnostic tool for lymphocytic thyroiditis, with cytological grading providing valuable morphological assessment. However, cytological grades do not show a consistent or statistically significant correlation with biochemical, immunological, or ultrasonographic parameters. A multidisciplinary approach integrating clinical, cytological, biochemical, and radiological findings is essential for accurate diagnosis and effective patient management.

INTRODUCTION

Thyroid disorders represent one of the most common endocrine diseases worldwide, with autoimmune thyroid diseases constituting a significant proportion of these conditions.[1] Among them, lymphocytic thyroiditis, also known as Hashimoto's thyroiditis is the most frequent cause of acquired hypothyroidism in iodine-sufficient regions and is the second most common thyroid lesion diagnosed on fine-needle aspiration cytology (FNAC), following colloid goiter.[2] The disease is characterized by progressive autoimmune-mediated destruction of thyroid follicles, leading to variable degrees of thyroid dysfunction.

Lymphocytic thyroiditis demonstrates a broad clinical spectrum ranging from euthyroid and subclinical hypothyroid states to overt hypothyroidism. The diagnosis relies on a combination of clinical findings, biochemical thyroid function tests, ultrasonographic features, serological markers such as anti–thyroid peroxidase (anti-TPO) antibodies, and cytological evaluation.[3] While biochemical parameters reflect functional status, they may not always correlate with morphological changes, particularly in early or evolving stages of the disease.[4]

FNAC remains the gold standard initial diagnostic modality for lymphocytic thyroiditis due to its simplicity, cost-effectiveness, and high diagnostic accuracy.[5] Cytomorphologically, the condition is characterized by lymphocytic infiltration of thyroid follicular cell clusters, Hurthle cell metaplasia, anisonucleosis, and variable background lymphoid populations.[6] Several authors have proposed cytological grading systems to stratify disease severity based on the degree of lymphocytic infiltration and associated morphological changes, aiming to correlate cytological findings with biochemical and clinical parameters.[7]

Despite the widespread use of cytological grading, the relationship between cytomorphological severity and thyroid hormonal status remains inconsistent across studies. Some reports suggest a correlation between higher cytological grades and hypothyroidism, whereas others have found no statistically significant association. [8,9] Additionally, anti-TPO antibody levels may be absent in a subset of patients, especially in the early stages, due to localized intrathyroidal antibody production without systemic spillover.[10]

Given these variations, correlating cytological grading of lymphocytic thyroiditis with biochemical parameters is essential to understand disease behavior better and improve diagnostic accuracy. The present study was therefore undertaken to evaluate FNAC features of lymphocytic thyroiditis, grade cases based on established cytological criteria, and assess their correlation with thyroid hormonal and immunological profiles.

MATERIALS AND METHODS

Study Design and Setting

This hospital-based cross-sectional observational study was conducted in the Department of Pathology at Gandhi Medical College, Bhopal, over a period of one year, from 1st January 2025 to 31st November 2025.

Study Population

The study included patients who underwent FNAC of the thyroid during the study period and were cytologically diagnosed as lymphocytic thyroiditis. A total of 45 cases fulfilling the inclusion criteria were evaluated during the study period.

Inclusion Criteria

Patients of any age and gender with a cytological diagnosis of lymphocytic thyroiditis through FNAC were included in the study.

Exclusion Criteria

Patients receiving thyroid hormone replacement therapy or antithyroid medications, those on drugs known to interfere with thyroid function, cases with inadequate or unsatisfactory FNAC smears, and patients with incomplete biochemical or radiological report were excluded from the study.

Clinical Evaluation

Detailed clinical history was obtained from all patients, including presenting complaints such as anterior neck swelling, discomfort during swallowing, and pain. Demographic details, including age and gender, were recorded for each patient.

Ultrasonographic Assessment

All patients underwent ultrasonographic evaluation of the thyroid gland. Based on sonographic appearance, findings were categorized as diffuse thyroiditis, nodular goitre, thyroid nodule, or normal thyroid study. These ultrasonographic findings were subsequently correlated with cytological grades.

Biochemical and Immunological Assessment

Five millilitre venous blood samples were collected under aseptic conditions for biochemical tests evaluation. Thyroid function profile included estimation of free triiodothyronine (fT3), free thyroxine (fT4), and thyroid-stimulating hormone (TSH). The reference ranges used were 2.5–3.9 pg/mL for fT3, 0.61–1.12 ng/dL for fT4, and 0.38–5.33 μIU/mL for TSH. Based on these values, patients were classified as hypothyroid, euthyroid, or hyperthyroid as per the standard criteria. Anti-thyroid peroxidase antibody (Anti TPO) levels were estimated by ELISA method, with values ranging from 0.01 to 10 IU/mL considered normal and values above this range considered elevated levels.

Fine-Needle Aspiration Cytology (FNAC) Procedure

Fine-needle aspiration cytology of the thyroid gland was performed using either the aspiration or non-aspiration technique with a 23-gauge needle attached to a 10-mL disposable syringe. Multiple passes were made when required to obtain adequate cellular

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material. Air-dried smears were stained with May–Grünwald–Giemsa stain, while wet-fixed smears fixed in 95% ethanol were stained with Hematoxylin and Eosin and Papanicolaou stains.

Cytomorphological Evaluation

All smears were examined independently by department's cytopathologists. The cytological features assessment included thyroid follicular epithelial cells, follicular lymphocytic infiltration, background lymphocytes, Hurthle cell change, anisokaryosis, colloid, histiocytes engulfing colloid, giant cells, epithelioid-like cells, granulomas, germinal center formation, and plasma cells.

Cytological Grading

Cytomorphological grading of lymphocytic thyroiditis was performed according to the criteria proposed by Bhatia et al[5]. Grade I showed thyroid follicular cell clusters infiltrated by a few lymphocytes; Grade II demonstrated moderate lymphocytic infiltration with Hurthle cell change, anisonucleosis, and increased background lymphocytes; and Grade III showed florid inflammation with a polymorphic lymphoid population and sparse follicular epithelial cells.

Correlation of Parameters

The cytological grades were correlated with thyroid functional status, Anti-TPO antibody levels, and ultrasonographic findings to assess any association between morphological severity and biochemical or radiological parameters.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS version. 27. Descriptive statistics were expressed as number/frequencies and percentages. The Chi-square test was used to assess the significance levels for categorical variables and a p-value≤0.05 was considered statistically significant.

RESULTS

Study Population and Demographic Profile

A total of 45 patients diagnosed with lymphocytic thyroiditis on FNAC were included in the present study. The study population showed a marked female predominance, with 40 females (88%) and 5 males (12%), resulting in a male-to-female ratio of 1:8.

Age-wise distribution revealed that patients ranged from 11 to 70 years. The maximum number of cases was observed in the 20–30-year age group, followed by the 30–40-year age group. Female patients predominated across all age groups. No cases were recorded in the 0–10-year age group. Male patients were relatively few and were mainly observed in the 20–30, 30–40, and 50–60-year age groups.

Clinical Presentation

The most common presenting complaint among patients was anterior neck swelling, reported in 67% of cases. Discomfort during swallowing was the second most frequent symptom, observed in 22.22% of patients. Pain was the least common complaint, reported by 11.11% of cases.

Cytological Features on FNAC

Cytological evaluation revealed thyroid follicular epithelial cells, follicular lymphocytic infiltration, and background lymphocytes in all 45 cases (100%), confirming the diagnosis of lymphocytic thyroiditis.

Among additional cytological features, Hurthle cell change was observed in 19 cases, and anisokaryosis in 18. Colloid was present in 16 cases, and histiocytes engulfing colloid were identified in 15 cases. Giant cells were seen in 8 cases, epithelioid-like cells in 7 cases, and granulomas in 6 cases. Germinal center formation and plasma cells were relatively uncommon; each observed in 3 cases. [Table 1]

Table 1: Cytological Features of cases

Cytological Feature	Number & Percentage of Cases
Follicular epithelial cells	45 (100%)
Follicular lymphocytic infiltration	45 (100%)
Background lymphocytes	45 (100%)
Hurthle cell change	19 (42.2%)
Anisokaryosis	18 (40.0%)
Colloid	16 (35.5%)
Histiocytes engulfing colloid	15 (33.3%)
Giant cells	8 (17.7%)
Epithelioid cells	7 (15.5%)
Granulomas	6 (13.3%)
Germinal centers	3 (6.7%)
Plasma cells	3 (6.7%)

Data is expressed as Number (N) & Percentage (%).

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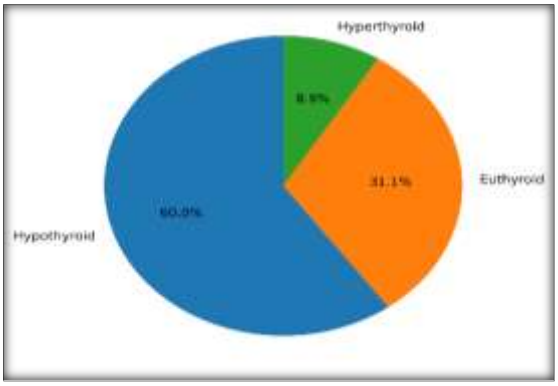

Figure 1: Distribution of patients as per Thyroid Function Status

Thyroid Function Status

Based on biochemical evaluation, hypothyroidism was the most common functional status, seen in 27 patients (60%). Euthyroid status was observed in 14 patients (31.11%), while hyperthyroidism was documented in 4 patients (8.11%). [Figure 1].

Cytological Grading of Lymphocytic Thyroiditis

Grading of lymphocytic thyroiditis was performed according to the criteria proposed by Bhatia et al. The majority of cases belonged to Grade II, accounting for 29 cases (65%). Grade I disease was observed in 14 cases (31%), while Grade III disease was observed in 2 cases (4%).

Table 2: Correlation Between Cytological Grade and Thyroid Status

Grades	Total Cases	Hypothyroid	Hyperthyroid	Euthyroid	*P-Value
Grade I	12 (100%)	6 (50%)	1 (8.3%)	5 (41.7%)	0.684
Grade II	25 (100%)	14 (56%)	2 (8.0%)	9 (36.0%)	
Grade III	8 (100%)	7 (87.5%)	1 (12.5%)	0 (0.0%)	
Total	45 (100%)	27 (60.0%)	4 (8.9%)	14 (31.1%)	

*Data is expressed as Number (N) & Percentage (%). *Chi-square test (p =0.684): Statistically significant (p≤ 0.05)*

On correlating cytological grades with thyroid status, hypothyroidism was most frequently observed in Grade II cases (14 cases), followed by Grade III (7 cases) and Grade I (6 cases). Euthyroid status was observed predominantly in Grades II (9 cases) and I (5 cases), with no euthyroid cases in Grade III. Hyperthyroidism was infrequent and distributed across all grades, with one case each in Grades I and III, and two instances in Grade II. Statistical analysis using the Chi-square test showed no statistically significant association between cytological grade and thyroid hormonal status (p>0.05). [Table 2]

Table 3: Correlation Between Cytological Grade and USG Findings

USG Finding	Grade I	Grade II	Grade III	Total	*P-Value
Diffuse thyroiditis	3 (10.7%)	15 (53.6%)	10 (35.7%)	28 (100%)	0.582
Nodular goitre	5 (62.5%)	2 (25.0%)	1 (12.5%)	8 (100%)	
Thyroid nodule	4 (57.1%)	3 (42.9%)	0 (0.0%)	7 (100%)	
Normal study	2 (66.7%)	1 (33.3%)	0 (0.0%)	3 (100%)	

*Data is expressed as Number (N) & Percentage (%). *Chi-square test (p =0.582): Statistically significant (p≤ 0.05)*

Ultrasonographic evaluation revealed that diffuse thyroiditis was the most common finding, seen in 28 cases (62.22%), followed by nodular goitre in 8 cases (17.77%), thyroid nodules in 7 cases (15.55%), and normal thyroid study in 2 cases (4.44%). Diffuse thyroiditis was predominantly associated with Grade III cytology (22 cases). Nodular goitre and thyroid nodules were observed across all grades, while normal ultrasonographic findings were limited to Grades I and II. The association between cytological grade and ultrasonographic findings was not statistically significant. [Table 3]

Table 4: Correlation Between Cytological Grade and Anti-TPO Antibody Levels

Cytological Grade	Raised Anti-TPO	Normal Anti-TPO	Total	*P-Value
Grade I	5 (50.0%)	5 (50.0%)	10 (100%)	0.423
Grade II	11 (78.6%)	3 (21.4%)	14 (100%)	
Grade III	19 (90.5%)	2 (9.5%)	21 (100%)	
Total	35 (77.8%)	10 (22.2%)	45 (100%)	

*Data is expressed as Number (N) & Percentage (%). *Chi-square test (p =0.423): Statistically significant (p≤ 0.05)*

Anti-TPO antibody levels were elevated in 35 patients, and 10 had normal levels. Elevated Anti-TPO levels were most commonly seen in Grade III cases (19 cases), followed by Grade II (11 cases) and Grade I (5 cases). Normal Anti-TPO levels were distributed across all grades. Statistical analysis showed no significant correlation between cytological grade and Anti-TPO antibody levels (p=0.423). [Table 4].

DISCUSSION

Lymphocytic thyroiditis is one of the most common autoimmune disorders of the thyroid gland and represents a frequent indication for FNAC in patients presenting with thyroid enlargement. In the present study, lymphocytic thyroiditis was predominantly observed in females, accounting for 88% of cases, with a male-to-female ratio of 1:8. This marked female preponderance is consistent with the autoimmune nature of the disease and has been well

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documented in earlier studies by Anila et al. and Shetty et al, who reported female predominance ranging from 80% to 90%.[7,8]

The majority of patients in the present study belonged to the 20–40-year age group, which is comparable to observations made by Bhatia et al. and Dhar et al., who reported peak incidence in young and middle-aged adults. [5,9] The absence of paediatric cases and the declining frequency in older age groups further support the known epidemiological pattern of lymphocytic thyroiditis.

Clinically, anterior neck swelling was the most common presenting complaint, followed by discomfort during swallowing and pain. A similar symptom distribution has been reported by Ashraf et al., in which painless thyroid enlargement was the predominant presentation.[17] This emphasizes the importance of FNAC in patients with thyroid swelling even in the absence of overt thyroid dysfunction.

Cytologically, all cases in the present study demonstrated thyroid follicular epithelial cells, follicular lymphocytic infiltration, and background lymphocytes, reaffirming that lymphocytic infiltration of thyroid follicles is the hallmark diagnostic feature of lymphocytic thyroiditis. Hurthle cell change, anisokaryosis, colloid, and histiocytes engulfing colloid were variably observed. These findings are consistent with the cytomorphological spectrum described by Orell et al. and Anila et al.[7,12] Less frequent features, such as giant cells, granulomas, germinal center formation, and plasma cells, were also noted, reflecting the heterogeneity of the immune response within the thyroid gland.

In the present study, Grade II lymphocytic thyroiditis was the most common cytological grade (65%), followed by Grade I (31%) and Grade III (4%). This predominance of intermediate-grade disease has also been reported by Bhatia et al. and Ashraf et al., suggesting that most patients present during the active phase of immune-mediated follicular destruction rather than at the extremes of mild or florid disease.[5,11]

Biochemical evaluation revealed hypothyroidism in 60% of patients, euthyroid status in 31.11%, and hyperthyroidism in 8.11% of cases. These findings align with previous studies indicating that hypothyroidism is the most frequent functional abnormality in lymphocytic thyroiditis. However, a substantial proportion of patients may remain euthyroid, particularly in early or subclinical stages.[4,8]

Significantly, the present study did not demonstrate a statistically significant correlation between cytological grade and thyroid hormonal status. Although hypothyroidism was more frequently observed in Grade II and Grade III cases, this association did not reach statistical significance. Similar lack of correlation has been reported by Anila et al. and Dhar et al., who emphasized that morphological severity does not always parallel functional impairment. [7,9] This may be explained by the patchy nature of lymphocytic infiltration and the variable functional reserve of thyroid tissue.

Ultrasonographic findings showed diffuse thyroiditis as the most common pattern, particularly in higher cytological grades. However, no statistically significant correlation was observed between cytological grade and USG findings. Bhatia et al. similarly reported that ultrasonographic patterns may not reliably predict cytological severity due to overlap between diffuse and nodular forms of autoimmune thyroiditis.[5]

Anti-TPO antibody levels were elevated in the majority of patients (35 out of 45), with higher positivity observed in Grade III cases. Nevertheless, the association between cytological grade and Anti-TPO levels was not statistically significant. This observation supports earlier reports by Ajjan et al, who noted that up to 7–33% of patients with Hashimoto's thyroiditis may be antibody-negative, particularly in early disease stages, due to intrathyroidal antibody production without systemic spillover.[10]

Overall, the findings of the present study reinforce the role of FNAC as a reliable and cost-effective diagnostic modality for lymphocytic thyroiditis. While cytological grading provides valuable morphological insight, it does not show a consistent or statistically significant correlation with biochemical, immunological, or ultrasonographic parameters. Therefore, a multidisciplinary diagnostic approach integrating clinical, cytological, biochemical, and radiological findings remains essential for accurate diagnosis and optimal patient management.

Limitations of the Study

The present study had certain limitations: because this is a single-center, hospital-based cross-sectional study, the findings may not be generalizable to the broader population. The relatively small sample size may have limited the statistical power to detect subtle associations between cytological grades and biochemical or immunological parameters. Follow-up data were not available; therefore, longitudinal changes in thyroid function, antibody status, and progression of cytological grades could not be assessed. Additionally, histopathological correlation was not performed, as surgical specimens were not available for all cases. However, despite these limitations, the study provides meaningful insight into the cytomorphological spectrum of lymphocytic thyroiditis and its clinic-biochemical correlation.

CONCLUSION

Lymphocytic thyroiditis predominantly affects young to middle-aged females and commonly presents with anterior neck swelling. Fine-needle aspiration cytology remains a simple, reliable, and cost-effective diagnostic modality, with lymphocytic infiltration of thyroid follicles serving as the pathognomonic feature. Although cytological

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grading provides valuable morphological insight into disease severity, the present study did not demonstrate a statistically significant correlation between cytological grade and thyroid hormonal status, Anti-TPO antibody levels, or ultrasonographic findings. These findings highlight that cytomorphological severity does not consistently reflect functional or immunological status. Therefore, accurate diagnosis and optimal patient management require a multidisciplinary approach integrating clinical features, cytological findings, biochemical parameters, and radiological evaluation.

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