

Clinical Utility of Thyroid Autoantibodies in Early Detection of Autoimmune Thyroid Disease in a Tertiary Care Hospital of Bangladesh

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ABSTRACT

Background: Autoimmune thyroid disease (AITD) is the most common organ-specific autoimmune disorder worldwide. Early detection is essential to prevent complications such as hypothyroidism, hyperthyroidism, and associated metabolic consequences. Thyroid autoantibodies such as anti-thyroid peroxidase (anti-TPO), anti-thyroglobulin (anti-Tg), and TSH receptor antibodies (TRAb) are key markers for detecting subclinical and early-stage AITD. **Objective:** To evaluate the clinical utility of thyroid autoantibodies in early detection of autoimmune thyroid disease presenting with suspected thyroid dysfunction. **Methods:** A cross-sectional observational study was conducted over 12 months on 45 patients with clinical suspicion of thyroid disease. Serum levels of TSH, FT4, FT3, anti-TPO, anti-Tg, and TRAb were measured and correlated with clinical and ultrasonographic findings. **Results:** Anti-TPO antibodies were positive in 71.1% (n=32) of cases, anti-TG in 55.5% (n=25), and TRAb in 17.7% (n=8) in autoimmune thyroid patients. Among patients with normal thyroid function tests (TFTs), 33.3% had positive anti-TPO antibodies, indicating early autoimmune thyroiditis. Female patients showed significantly higher antibody positivity ($p<0.05$). **Conclusion:** Thyroid autoantibody testing, particularly anti-TPO, is a sensitive tool for detecting early AITD, even in euthyroid individuals. Routine screening in high-risk groups (females, family history of thyroid disease) is recommended for early diagnosis and management.

Keywords: Autoimmune thyroid disease, Anti-TPO, Anti-Tg, TRAb, Euthyroid thyroiditis

INTRODUCTION

Autoimmune thyroid disease (AITD) is the most prevalent organ-specific autoimmune disorder worldwide, affecting approximately 5–10% of the population, with a marked female predominance [1]. It encompasses two main entities; Hashimoto's thyroiditis, the leading cause of hypothyroidism and Graves' disease, the leading cause of hyperthyroidism [2]. Both disorders are characterized by the presence of circulating autoantibodies directed against thyroid peroxidase (TPO), thyroglobulin (Tg) or the thyroid-stimulating hormone receptor (TSHR) [3]. The pathogenesis of AITD involves a combination of genetic susceptibility and environmental factors. Certain HLA class II alleles (HLA-DR3, DR4, DR5) and immune regulatory gene polymorphisms (CTLA-4, PTPN22) increase disease risk [4]. Environmental triggers such as excessive iodine intake, stress, smoking, and infections can precipitate the autoimmune process [5]. The resulting immune activation leads to lymphocytic infiltration of the thyroid gland, production of autoantibodies, and progressive destruction or stimulation of thyroid tissue. Early detection of AITD is clinically significant because thyroid dysfunction may remain subclinical for years before becoming symptomatic. Subclinical hypothyroidism defined by elevated thyroid-stimulating hormone (TSH) levels with normal free thyroxine (FT4) is strongly associated with anti-TPO positivity and carries a higher risk of progression to overt hypothyroidism [6]. Similarly, the presence of TSH receptor antibodies (TRAb) can predict the future development or relapse of Graves' hyperthyroidism [7]. Thyroid autoantibody measurement offers a convenient and sensitive means of identifying individuals at risk of AITD before biochemical or clinical manifestations occur. Anti-TPO is regarded as the most sensitive marker for Hashimoto's thyroiditis, while anti-Tg serves as a complementary test [3]. TRAb measurement is highly specific for Graves' disease which can also be used to monitor treatment response and predict neonatal thyrotoxicosis in pregnant women [7]. Given the high prevalence of AITD and its potential complications including cardiovascular risk, infertility, pregnancy loss, and reduced quality of life, early identification is a crucial public health priority. This study aimed to evaluate the clinical utility of thyroid autoantibodies in 45 patients presenting with suspected thyroid dysfunction, focusing on early or subclinical disease detection and identification of individuals who may benefit from regular follow-up and timely management.

MATERIALS AND METHODS

Study Design and Setting

This was a cross-sectional observational study conducted in the Department of Laboratory Medicine and Department of Endocrinology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh over a period of 12 months from March 2022 to February 2023. Informed written consent was collected from all participants prior to enrollment.

Study Population

- **Inclusion criteria:** Patients aged 18-65 years presenting with symptoms suggestive of thyroid dysfunction (fatigue, weight changes, neck swelling, palpitations) with or without abnormal TFTs.
- **Exclusion criteria:** Patients on thyroid medication, pregnant women, and those with non-thyroidal autoimmune disorders were excluded.

Sample Size

A total of 45 patients were included.

Laboratory Investigations

- **Hormonal profile:** Serum TSH, FT3, FT4 measured using chemiluminescent immunoassay.
- **Autoantibody profile:** Anti-TPO, anti-Tg, and TRAb levels measured using ELISA.
- **Reference cut-offs:**
 - Anti-TPO > 35 IU/mL considered positive
 - Anti-Tg > 40 IU/mL considered positive
 - TRAb > 1.75 IU/L considered positive

Statistical Analysis

Data were analyzed using SPSS version 26. Continuous variables were expressed as mean $\pm$ SD, and categorical variables as percentages. Chi-square test was applied for group comparisons, with $p < 0.05$ considered statistically significant.

RESULTS

A total of 45 patients were enrolled in the study, with a mean age of 34.6 ± 10.8 years. There was a clear female predominance, with 33 (73.3%) females and 12 (26.7%) males, resulting in a female-to-male ratio of approximately 2.7:1. The majority of patients presented with symptoms such as fatigue, weight changes, neck swelling, and palpitations.

Regarding thyroid autoantibody status, anti-thyroid peroxidase (anti-TPO) antibodies were positive in 32 patients (71.1%), making it the most frequently detected autoantibody in the cohort. Anti-thyroglobulin (anti-Tg) antibodies were positive in 25 patients (55.5%), while TSH receptor antibodies (TRAb) were found in 8 patients (17.7%). Among the 18 euthyroid individuals, 6 (33.3%) were anti-TPO positive and 4 (22.2%) were anti-Tg positive, indicating early or latent autoimmune thyroiditis despite normal thyroid function tests.

In patients with subclinical hypothyroidism ($n=12$), anti-TPO positivity was particularly high (83.3%), with a concurrent anti-Tg positivity of 66.7%. Among overt hypothyroid patients ($n=10$), anti-TPO and anti-Tg were positive in 90.0% and 80.0% respectively, confirming the strong association of antibody positivity with advanced disease. Hyperthyroid patients ($n=5$) showed anti-TPO positivity in 60% of cases, while all five were anti-Tg positive. TRAb positivity was predominantly seen in hyperthyroid

patients, accounting for 62.5% of all TRAb-positive cases, consistent with its known specificity for Graves’ disease.

Overall, the frequency of autoantibody positivity was significantly higher in females compared to males ($p < 0.05$), corroborating the known female predisposition to autoimmune thyroid disease. The distribution of antibody positivity across different thyroid function categories is illustrated in Figure 1, which demonstrates the highest rates of positivity among overt hypothyroid and subclinical hypothyroid groups, with a notable proportion of antibody positivity even among euthyroid participants.

Table-1: Autoantibody Positivity

Autoantibody	Positive Cases (n)	Percentage (%)
Anti-TPO	32	71.1%
Anti-Tg	25	55.5%
TRAb	8	17.7%

Table-2: Correlation with Thyroid Function

Thyroid Function Status	n	Anti-TPO Positive (%)	Anti-Tg Positive (%)
Euthyroid	18	6 (33.3%)	4 (22.2%)
Subclinical Hypothyroid	12	10 (83.3%)	8 (66.7%)
Overt Hypothyroid	10	9 (90.0%)	8 (80.0%)
Hyperthyroid	5	3 (60.0%)	5 (100%)

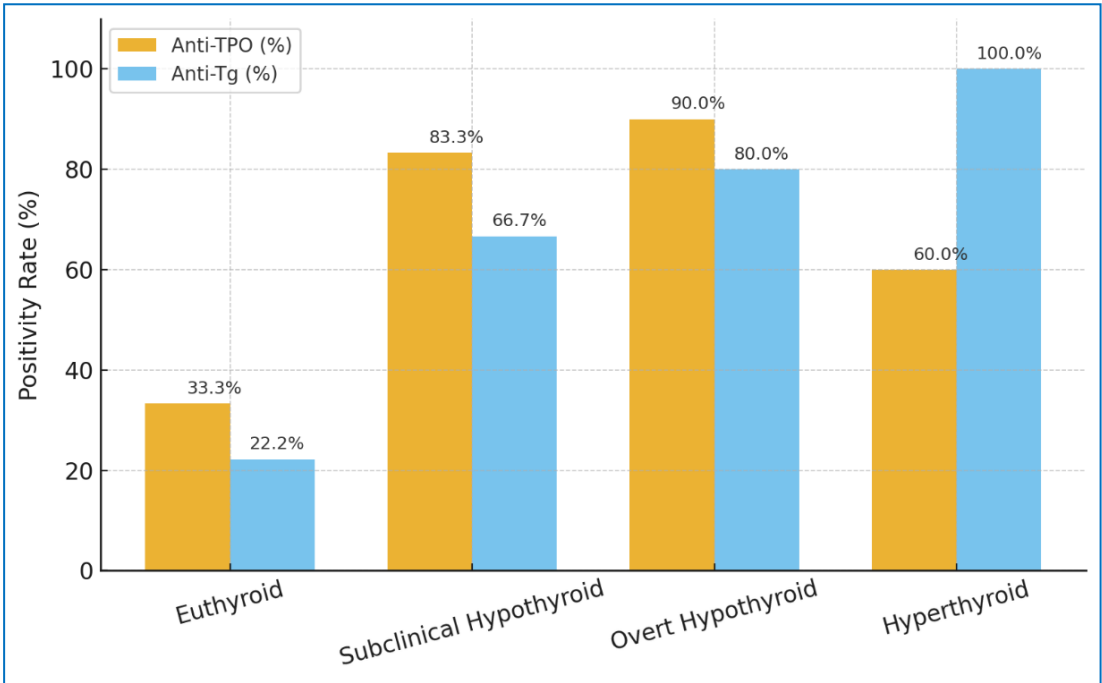


Figure-1: Bar chart showing percentage positivity of thyroid autoantibodies among study subjects

DISCUSSION

This study highlights the clinical relevance of thyroid autoantibody testing in the early identification of autoimmune thyroid disease. In our study, 71.1% of patients were positive for anti-TPO antibodies, which aligns with previous studies reporting a prevalence of 70–90% among patients with autoimmune hypothyroidism [2,3]. Importantly, 33.3% of euthyroid individuals were anti-TPO positive, reflecting latent autoimmune thyroiditis. This observation is supported by data from the Whickham Survey, which demonstrated that antibody-positive euthyroid women have an annual risk of 4–5% for progression to overt hypothyroidism [1]. Anti-Tg antibodies were positive in 55.5% of patients in our study. Although anti-Tg is less sensitive than anti-TPO for diagnosing Hashimoto's thyroiditis, its utility lies in complementing anti-TPO, especially in cases where anti-TPO is negative [3]. Combined testing of anti-TPO and anti-Tg enhances diagnostic yield, which is especially valuable in pediatric and borderline cases [5]. TRAb positivity was seen in 17.7% of patients, predominantly those with hyperthyroidism, corroborating its role as a specific marker for Graves' disease [7]. TRAb measurement is also prognostically useful, as declining levels during antithyroid therapy are associated with remission, whereas persistently elevated levels predict relapse [7]. The high female predominance of antibody positivity in our study (73.3%) is consistent with the established female preponderance of AITD, attributed to hormonal factors and X-chromosome-linked immune regulation [4]. These findings support targeted screening strategies in women of reproductive age, particularly those with a family history of thyroid disease, other autoimmune disorders, or infertility [8]. From a clinical perspective, our results advocate for incorporating thyroid autoantibody testing in the diagnostic work-up of patients with suggestive clinical symptoms, even in the presence of normal thyroid function tests. This approach allows for early diagnosis, closer surveillance, and prevention of complications such as dyslipidemia, goiter, and adverse pregnancy outcomes [9,10]. However, this study has limitations, including a relatively small sample size and lack of long-term follow-up, which would have enabled observation of disease progression in antibody-positive euthyroid individuals. Future longitudinal studies with larger cohorts are warranted to evaluate the predictive value of antibody titers for clinical outcomes and to establish cost-effective screening guidelines for high-risk populations.

CONCLUSION

Thyroid autoantibody testing, particularly anti-TPO, is a valuable tool for early detection of autoimmune thyroiditis, even before biochemical derangements appear. Incorporating antibody testing into diagnostic workup of patients with suspected thyroid dysfunction may facilitate early intervention and reduce morbidity.

Conflict of Interest: None.

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