

Relationship between Anti-Thyroid Peroxidase Antibody and Thyroid Function Test

Seyed Mahmood Ghoraishian^{1*}, Seyed Hossein Hekmati Moghaddam²,
Mohammad Afkhami-Ardekani³

¹Department of Immunology, Medical School, ²Department of Laboratory Sciences, Paramedical School, ³Department of Endocrinology, Medical School, Yazd University of Medical Sciences, Yazd, Iran.

ABSTRACT

Background: Anti-thyroid peroxidase antibody (anti-TPO antibody) is a member of thyroid autoantibodies which are important in inducing and also diagnosing autoimmune thyroid diseases. Thyroid autoimmunity can cause several forms of thyroiditis and abnormal thyroid functions, ranging from hypothyroidism to hyperthyroidism. **Objective:** To evaluate the relationship between serum levels of anti-TPO antibody and thyroid function test parameters (T3, T4, and TSH) in patients with thyroid disease. **Methods:** In 2425 subjects suspected of having thyroid disease referred to Yazd central medical laboratory by physicians during a 2 year period, the concentrations of serum anti-TPO antibody (ELISA) and T3, T4, and TSH (RIA) were measured. **Results:** 53.53% of the patients were 20 to 39 years old. 2135 patients (88.04%) were female and 290 (11.96%) were male. The levels of T3, T4, and TSH in individuals with normal and raised anti-TPO antibody titers was significantly different ($P < 0.0001$). A correlation between TSH and T4 levels and abnormal anti-TPO antibody was detected ($P = 0.002$). **Conclusion:** Our results confirm the correlation between thyroid function test and anti-TPO antibody values, indicating the clinical significance of this antibody and suggesting a through clinical examination and follow up of individuals with high anti-TPO antibody titer.

Keywords: Autoimmune, Anti-TPO, Thyroid Disease

*Corresponding author: Dr. Seyed Mahmood Ghoraishian, Department of Immunology, Medical School, Yazd University of Medical Sciences, Yazd, Iran, Tel: (+) 98 351 8229500, Fax: (+) 98 351 8229500, e-mail: smghoraishian@hotmail.com

INTRODUCTION

Autoimmune thyroid diseases are common organ-specific autoimmune disorders mostly seen in women 30-50 years old (1). About 2% to 4% of women and up to 1% of men are affected worldwide and the prevalence increases with advanced age (2). Thyroid autoimmunity can cause several thyroid disorders including Graves disease, Hashimoto thyroiditis, atrophic autoimmune thyroiditis, hypothyroidism, postpartum thyroiditis, and thyroid-associated ophthalmopathy. Hashimoto thyroiditis and Graves disease are the two most common types, sharing many features immunologically (3,4). Anti-thyroid peroxidase antibody (anti-TPO antibody) is important in diagnosing autoimmune thyroid diseases and judging treatment efficacy (5). Anti-TPO antibody is also found in sera of about 10% of normal adults, with an increasing prevalence (up to 30%) in older adults (4). Anti-TPO antibodies are more likely to be of pathogenic importance than other antibodies as they fix complement and may directly damage thyroid cells (6). Serum anti-TPO antibody concentrations are positively correlated with the activity of chronic autoimmune thyroiditis (7). More patients with thyroiditis have elevated serum anti-TPO than anti-thyroglobulin antibody concentrations (8). Anti-TPO antibodies are cytotoxic in vitro, as detected by antibody-dependent cell cytotoxicity tests (9), thus are likely to be involved in the development of hypothyroidism (10).

Anti-TPO antibodies may exaggerate or perpetuate thyroid injury but probably do not initiate it, this issue is not settled as yet (4). Therefore, the evaluation of serum anti-TPO antibody levels with respect to serum concentration of thyroid hormones would help in elucidating its probable pathogenic role in induction of hypo- or hyperthyroidism.

MATERIALS AND METHODS

In this cross-sectional study 2425 cases, suspected of having thyroid disease referred by endocrinologist to the central laboratory of Yazd University of Medical Sciences during a 2-year-period (1382 and 1383) were included. Sera were stored at -80°C , anti-TPO antibody was measured using enzyme-linked immunosorbent assay (ELISA) method (Radim Co, Italy). Serum TSH, T3, and T4 were measured using radioimmunoassay (RIA) method (Kavoshyar Co, Iran). Determinations in the following ranges were considered normal: T4 =4.5–11 ug/dL, T3 =70-204 ng/dL, TSH=0.3-4 mIU/L, anti-TPO <100 IU/mL. Data regarding age and sex of participants were also recorded. Statistical analyses were performed using Chi-Square and Pearson correlation tests. P-values less than 0.05 were statistically significant.

RESULTS

A total of 2425 individuals including 2135(88.04%) female and 290(11.96%) male cases (53.53% between 20 to 39 years), suspected of having thyroid disease were evaluated. The frequency of subjects with normal anti-TPO antibody compared with elevated anti-TPO antibody titer differed significantly in various age groups ($P<0.0001$). Elevated anti-TPO antibody levels were found in 32.5% of men com-

pared with 36.2% of women. Differences in the distribution of anti-TPO antibody according to TSH, T4, and T3 values were statistically significant ($P < 0.0001$). (Table 1-3)

There was a positive correlation between TSH and high anti-TPO antibody values ($r = 0.107$, $P = 0.04$). Furthermore, T4 and high anti-TPO antibody were negatively correlated ($r = -0.160$, $P = 0.002$).

Table 1. Distribution of anti-TPO antibody according to TSH concentration

Anti-TPO TSH	Normal		Elevated		Total	
	Number	Percent	Number	Percent	Number	Percent
Low	181	54.68	150	45.32	331	100
Normal	1223	73.76	435	26.24	1658	100
High	155	35.55	281	64.45	436	100

Chi-Square, P-value < 0.0001

Table 2. Distribution of anti-TPO antibody according to T4 concentration

Anti-TPO T4	Normal		Elevated		Total	
	Number	Percent	Number	Percent	Number	Percent
Low	26	32.5	54	67.5	80	100
Normal	1293	65.77	673	34.24	1966	100
High	240	63.33	139	36.68	379	100

Chi-Square, P-value < 0.0001

Table 3. Distribution of anti-TPO antibody according to T3 concentration

Anti-TPO T3	Normal		Elevated		Total	
	Number	Percent	Number	Percent	Number	Percent
Low	14	35.89	25	64.11	39	100
Normal	1367	64.39	756	35.61	2123	100
High	178	67.68	85	32.32	263	100

Chi-Square, P-value < 0.0001

DISCUSSION

In the present study, 58.42% of patients with high anti-TPO antibody were 20-39 years old and 89.14% were female. According to Swain et al study, 95% of the patients with autoimmune thyroid disease are women, mainly 30-50 years old. (1)

In this study the prevalence of anti-TPO antibody in women was about 7 times greater than men, Canaris et al reported that autoimmune thyroid diseases affect women 2 to 4 times more than men (2). Similar results were found in a health survey in Norway, in which the prevalence of pathologic anti-TPO antibody was 13.9% in females and 2.8% in males, their cut-off value for anti-TPO antibody was 200 IU/mL compared with 100 IU/mL in our study, aiming not to include those with weakly positive antibodies (11). These findings are in accordance with higher rate of female involvement in other autoimmune diseases.

Table 1 reveals that in cases with high TSH concentration, 35.55% have normal anti-TPO antibody and 64.45% have abnormally high anti-TPO antibody, also differences between cases with normal and high antibody titer were significant ($P < 0.0001$). According to Vanderpump et al study, higher serum levels of TSH, particularly titers above 2 mIU/L, correlate with prognostic significance for development of overt hy-

pothyroidism, considering both anti-TPO positive and negative subjects (12). Bjoro et al in a 20-year follow-up study found that positive anti-TPO antibody is strongly correlated with thyroid dysfunction; also the prevalence of elevated TSH was nearly 10-fold higher both in females and males having positive anti-TPO antibody compared with negative anti-TPO antibody (11). Kontiainen et al found elevated levels of anti-TPO antibody in 47% and 12% of samples with abnormal and normal levels of TSH, respectively. They demonstrated that 61% of patients with hypothyroidism and 26% with hyperthyroidism had high levels of this antibody (13).

We showed (Table 2) that in patients with low T4, 32.5% of cases had normal anti-TPO antibody, while 67.5% had abnormally high antibody titers ($P < 0.0001$). According to Silva et al, anti-TPO antibody is found in over 90% of patients with autoimmune hypothyroidism and Graves disease (14). We showed that there is a significant correlation between TSH or T4 concentration and elevated anti-TPO antibody in the studied population ($P = 0.04$ and 0.002 , respectively).

To conclude, our results confirm the correlation between thyroid function test and anti-TPO antibody values, emphasizing the clinical significance of this antibody and suggesting a through clinical examination and follow up of individuals with high anti-TPO antibody titer.

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