



Original Article

Relationship of thyroid peroxidase antibody test with abnormal thyroid function tests

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ABSTRACT

Background: Autoimmune thyroid disease results from a complex interaction between genetic and environmental factors. The aim of this study was to find association of anti-thyroid peroxidase antibody with abnormal thyroid function tests.

Materials and Methods: This is a retrospective study, conducted in 160 patients who showed abnormal thyroid function tests in grande city clinic and hospital services and Kantipur dental college for duration of 18 months since Baisakh 2072.

Results: Among 160 individuals, 126(78.8%) were female and 34(21.2%) were male. Subclinical hypothyroidism (56.3%) were most common than overhypothyroidism (18.0%), overhypothyroidism (16.9%) and subclinical hyperthyroidism (8.8%). Anti thyroid peroxidase antibodies test was shown positive in 102/160 (63.8%) cases.

Conclusion: According to the present study, anti- thyroid peroxidase antibody has been significantly associated with thyroid dysfunction, it can be used as diagnostic marker for thyroid autoimmune diathesis.

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INTRODUCTION

Among the autoimmune diseases of thyroid gland, three cases of Grave disease with hyperthyroidism were first described by Robert Graves in 1835. Then, in 1912, Hakaru Hashimoto reported four cases of goiter with lymphocytic infiltration, which he called "struma Lypomatosa". Belyavin and Trotter, in 1959, described about the autoantibodies reactive to thyroid gland-specific antigen called "microsomal antigen" in the sera of a patient with Hashimoto thyroiditis. Many years later microsomal antigen was identified as thyroid peroxidase (TPO), the key enzyme in the biosynthesis of thyroxine (T4) and tri-iodothyronine (T3). Thyroid Peroxidase catalyzes the iodination of tyrosine residues to form monoiodotyrosine and diiodotyrosine.

Thyroid Peroxidase further enhance the coupling of hormonogenic monoiodotyrosine and diiodotyrosine with thyroglobulin to form T3 and T4.^{1,2}

Anti-Thyroidperoxidase(anti-TPOAbs),anti-thyroglobulin (anti-TgAbs) and antibodies to the thyroid stimulating hormone receptor (anti-TSHRAs) are three major autoantibodies of autoimmune thyroiditis. They can be measured in patient sera using complement fixation or immunofluorescence on thyroid tissue sections,most commonly by enzyme-linked immunoassay.^{2,3}

Anti-TPOAb is more likely to be pathogenically important than other autoantibodies as it fixes complement and directly causes damage to thyroid cells. Anti-TPOAb reflects lymphocytic infiltration even in subclinical state of thyroid dysfunction.^{2,4,5} The present study has evaluated anti-TPOAb level in patients with abnormal thyroid function test.

MATERIALS AND METHODS

The present study was conducted in grande city clinic and hospital services and Kantipur Dental college for duration of 18 months since Baisakh 2072. Permission was obtained from institutional review committee.

Free T3, Free T4 and TSH were measured using the VITROS reagent pack and VITROS calibrators on the VITROS ECI/ECIQ immunodiagnostic systems, the VITROS 3600 Immunodiagnostic system and VITROS 5600 Integrated system , a direct labelled antibody , competitive immunoassay technique .

Test for Anti TPO antibodies was performed using enzyme –linked immunosorbent assay (ELISA- EuroDiagnostica). The ELISA is intended for the qualitative determination of IgG antibodies in human serum directed against TPO.

Measuring range of Free T4 in the system is 0.07-6.99ng/dl with euthyroid reference interval of 0.78-2.19ng/dl . Measuring range of Free T3 in the system is 0.50-22.8ng/dl with euthyroid reference interval of 2.77-5.27ng/dl. Measuring range of TSH in the system is 0.015-100uIU/ml with euthyroid reference interval of 0.485-4.68uIU/ml.

Reference range for anti- TPO antibodies is negative if less than 10 IU/ml and positive if more than 10IU/ml.

Data entry was done in MS. Excel and analysis were done using SPSS16. Statistical analyses were performed using Chi- square and Pearson correlation test. P-value less than 0.05 were statistically significant.

RESULTS

Serum of 160 individuals with abnormal thyroid function tests was analysed for anti TPO antibody. Among 160

individuals, 126(78.8%) were females and 34(21.2%) were males with male to female ratio of 1:2.9. Large number of patients in the present study belonged to 20 – 39 years age groups with mean age of 39.07, SD: ±12.84.

Table 1 shows frequency of various states for thyroid. Subclinical hypothyroidism (n=90; 56.3%) was more common than overt hyperthyroidism (n=29; 18.0%), overt hypothyroidism (n=27; 16.9%) and subclinical hyperthyroidism (n=14; 8.8%).

In present study, anti TPO antibody test was positive in 102(63.8%) cases among them 86 (53.8%) were females and 16 (10%) were males Table 2. Table 3 displays 49/90 cases of subclinical hypothyroidism and 25/29 cases of overt hypothyroidism with elevated anti-TPOAb. Similarly, Table 4 reveals that 5/14 cases of subclinical hyperthyroidism and 22/27 cases of overt hyperthyroidism showed elevated anti-TPOAbs.

Correlation was tested between anti-TPOAbs and hypothyroidism and hyperthyroidism using Pearson's correlation . There is significant positive correlation (Chi- Square test =9.410,p value=0.001,r=0.281 and p value =0.002) between subclinical hypothyroidism and overt hypothyroidism with anti-TPOAbs test. Subclinical hyperthyroidism and overt hyperthyroidism state also showed significant positive correlation (chi-square test =8.588,p value=0.005,r=0.458 and P value=0.003) with anti-TPOAbs test (Table 3 and 4) .

At confident interval 95%, mean serum FT3, FT4 and TSH were 1.99+0.572 and 1.96+0.530 and 2.49+0.869mIU/L (P-value <0.0001) respectively (Table 5).

DISCUSSION

In the present study, among 160 individuals, 126(78.8%) were females and 34(21.2%) were males with male to female ratio of 1:2.9. In a study by Ghoraishai et al, 88.04% were females and 11.96% were males. Similarly, Shinto et al study also showed female predominance where 91 patients were females and 9 were males.^{5,6}

In this study, subclinical hypothyroidism (56.3%) was more commonly seen than overt hyperthyroidism (18.0%), overt hypothyroidism (16.9%) and subclinical hyperthyroidism (8.8%). The results of a study by Hoogendoorn et al showed thyrotoxicosis in 1.2% (overt in 0.4%, subclinical in 0.8%) and hypothyroidism in 4.4%(overt in 0.4% and subclinical in 4.0%).⁷ According to Legakis et al, overt thyrotoxicosis was found in 4.95% and subclinical thyrotoxicosis in 5.50% of total population.⁸ Overt hypothyroidism was found in 1.43% and subclinical hypothyroidism in 4.51%. In shinto et al study, fifty –nine patient (59%) were classified as having Hashimoto's and 41 patients (41%) were classified as having autoimmune thyroiditis.⁶

Table 1: Sex distribution in four categories (subclinhypo/subclinhyper/overthypo/overthyper)

Sex	Subclinical hypothyroidism	hyperthyroidism	overt hypothyroidism	overt hyperthyroidism	Total n (%)
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency	Frequency
Male	23 (14.4)	3 (1.9)	6 (3.8)	2 (1.2)	34 (21.2)
Female	67 (41.9)	11(6.8)	21 (13.1)	27 (16.8)	126 (78.8)

Table 2: Evaluation of TPO in percentage in gender

Gender	< 10.0 IU/ml	> 10.0 IU/ml	Total
	Frequency (%)	Frequency (%)	Frequency (5)
Male	18 (11.2)	16 (10.0)	34 (21.2)
Female	40 (25.0)	86 (53.8)	126 (78.8)
Total	58 (36.2)	102 (63.8)	160 (100)

Table 4: Relation between anti-TPOAbs and hyperthyroidism

TPO	Sub clinical hyperthyroidism	Overt hyperthyroidism	Total
	Frequency (%)	Frequency (%)	Frequency (5)
Less than 10	9 (64.3)	5 (35.7)	14 (100)
More than 10	5 (18.5)	22 (81.5)	27 (100)

Chi-Square, p-value 0.005, Correlation, p value 0.003

Large number of patients in the present study belonged to 20 – 39 years age group with mean age of 39.07, SD: ± 12.84 . Similar results was found in a retrospective cross-sectional study done in Father Muller Medical college Mangalore, in which the average age was 37.16 years.⁹ In the study of Elmgadam AA et al the mean age was 39.3 years where 89.9% of the patients were females and 10.1% males.¹⁰

According to Ghoraiashian et al study, 58.42% of patients with high anti TPO antibody were 20-39 years old and 89.14% were females.⁵ In present study, anti TPO antibodies test was shown high in 102/160 (63.8%) cases among them 86 (53.8%) were female and 16 (10%) were male patients. Similarly, positive anti TPO antibodies test was more in age of 20-39 years (54.9%) with mean age 38.2% and standard deviation of 1.13. In the study of Thomas Cyriac et al, most cases with anti TPO antibody positivity were in the 31-40 age groups. The average age of the patient in the study being 35.4 years.¹¹

The present study has evaluated anti-TPOAb level in patients with abnormal thyroid function test. In this

Table 3: Relation between anti-TPOAbs and hypothyroidism

TPO	Sub clinical hypothyroidism	Overt hypothyroidism	Total
	Frequency (%)	Frequency (%)	Frequency (%)
< 10	41 (91.1)	4 (8.9)	45 (100)
> 10	49 (66.2)	25 (33.8)	74 (100)

Chi-Square, p-value 0.001, Correlation, p value 0.002

study, anti TPO antibody were positive in 62.2% of hypothyroidism (49/90 cases of subclinical and 25/29 cases of overt hypothyroidism). Similarly, 65.9% of cases of hyperthyroidism (5/14 subclinical hyperthyroidism and 22/27 overt hyperthyroidism) showed elevated anti TPO antibodies. Study conducted in Yazd central medical laboratory by physicians in Iran reveal that in cases with high TSH concentration, 35.55% had normal antiTPO antibody and 64.45% had abnormal high anti TPO antibody. Kontiainen et al also found elevated levels of anti TPO antibody in 47% and 12% of samples with abnormal and normal TSH, respectively. They demonstrated that 61% of patients with hypothyroidism and 26% with hyperthyroidism had high level of this antibody.^{5,12,13}

Present study showed mean serum FT3, FT4 and TSH as 1.99+0.572, 1.96+0.530 and 2.49+0.869mIU/L (P-value <0.0001) respectively at confident interval 95%. Madhuvan HS et al showed mean TSH :2.71+/-1.66, T3 :1.20+/-0.52 and T4:6.92+/-1.70.¹²

CONCLUSION

Anti-TPOAbs are one of the hallmarks of autoimmune thyroid diseases. They are detected in the sera of the majority of subclinical and overt thyroid diseases. If anti-TPOAb is found in subclinical thyroid diseases, Laboratory staff should add a comment regarding the patient at risk of developing overt disease. We, laboratory personnel, can take lead to ensure that these antibodies are estimated to investigate subclinical as well as overt thyroid dysfunction.

Table 5: Mean with range and standard deviation of anti-TPO and thyroid function tests

Thyroid peroxidase (anti- TPO) antibody test	Mean + Std. deviation	t - value	p - value	Lower	Upper
FT3	1.99+0.572	43.971	0.000	1.90	2.08
FT4	1.96+0.530	46.672	0.000	1.87	2.04
TSH	2.49+0.869	36.222	0.000	2.35	2.62

* 95% Confidence Interval of the Difference

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Conflict of interest: None

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