ORIGINAL ARTICLE

Prevalence of Anti-Thyroid Peroxidase Antibody in Hypothyroid Patients Visiting Western Regional Hospital: A Cross-Sectional Study

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Abstract

Introduction: Hypothyroidism is a common endocrine disorder with autoimmune thyroiditis increasing as a major cause, especially in iodine-sufficient areas. Anti-thyroid peroxidase antibody is hallmark of autoimmune thyroid disease. This study aims to determine the prevalence of anti-TPO antibodies in hypothyroid patients and their correlation with the type of hypothyroidism, age, gender, and clinical presentation.

Methods: This is an analytical cross-sectional study conducted among 73 hypothyroid patients presenting to OPD and medical ward of Western Regional Hospital, a tertiary care centre in Gandaki Province. Demographic and clinical data were collected. Laboratory assessments included thyroid function tests and anti-TPO levels using chemiluminescence immunoassay. Descriptive and inferential statistics were applied using Statistical Package for the Social Sciences version 27.

Results: Among 73 participants, 28(38%) were positive for anti-TPO antibody. The mean age was 42.1 ± 12.07 years, and 81% patients were female. Among patients with overt hypothyroidism, 41% were anti-TPO positive, while 36% of subclinical hypothyroid patients had anti-TPO positivity. There were no statistically significant associations between anti-TPO status and gender (p=0.821), type of hypothyroidism (p=0.666), or age group (p=0.24). Likewise, the common presenting signs and symptoms did not have statistically significant association with the TPO positivity status.

Conclusions: Over one-third of hypothyroid patients had anti-TPO antibody positivity, with a slightly higher prevalence in overt hypothyroidism. However, demographic and clinical variables did not significantly correlate with antibody status.

Keywords: *anti-thyroid peroxidase antibody; autoimmune thyroiditis; hypothyroidism, subclinical hypothyroidism; thyroid function test.*

Introduction

Hypothyroidism is one of the common endocrine disorders which is due to decreased production of thyroid hormones. Clinically, it is classified as primary and secondary hypothyroidism. Primary hypothyroidism is further categorized into overt hypothyroidism (OH) and subclinical hypothyroidism (SCH).[1]

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Iodine deficiency is primary cause of hypothyroidism. However, with the widespread use of iodized salt, autoimmune thyroiditis has emerged as the predominant aetiology.[2] The hallmark of autoimmune hypothyroidism is presence of anti-TPO antibodies. Anti-thyroglobulin antibody and TSH receptor blocking antibodies are other autoimmune markers.[1]

Anti-TPO antibody targets the enzyme thyroid peroxidase, which is essential for thyroid hormone synthesis. Elevated anti-TPO levels are present in subclinical hypothyroid patients. Longitudinal studies have shown that autoimmune subclinical hypothyroid patients are at higher risk of progression to OH.[3]

However, there are only limited studies regarding the burden of autoimmune hypothyroidism in Nepal. This study is performed to evaluate the prevalence of anti-TPO antibody among hypothyroid patients.

Methods

This hospital-based analytical cross-sectional study was conducted at Western Regional Hospital (WRH), a tertiary care centre in Pokhara, Nepal. This hospital provides health care services to a diverse population in Gandaki Province at present. The study was carried out over a period of one year, from April 2023 to March 2024. Approval for the study was provided by the Institutional Review Committee (IRC) of Pokhara Academy of Health Sciences, under reference number 169/079. Adult patients aged 18 years and above, diagnosed with either overt or subclinical primary hypothyroidism, were enrolled in the study. Exclusion criteria included secondary hypothyroidism, pregnant or postpartum women, individuals previously treated with radioactive iodine or thyroid surgery, patients on medications affecting thyroid function such as lithium or amiodarone, and those diagnosed with euthyroid sick syndrome. The sample size was calculated using Cochran's formula

n= Z2PQ/d2, where n = required sample size, Z = 1.96 (at 95% confidence interval), P= estimated prevalence in the population (5%) ,Q = 100-P (if P is in %), d = margin of error(5%) resulting in a sample size of 73.[2] Participants were selected through purposive sampling method. All participants provided written informed consent before being enrolled. The consent was taken either in Nepali or in English Language as per the convenience of the participants. After taking the history, based on clinical features Thyroid Function Tests (TFT) was done. However some cases turned out to be subclinical. Also, some of the cases had the incidental finding without any clinical features. A structured proforma was used to collect demographic data, clinical features, and pertinent medical history. TFT including free triiodothyronine (fT3), free thyroxine (fT4), and thyroid-stimulating hormone (TSH), as well as anti-thyroid peroxidase antibody (anti-TPO) levels, were measured. Reference ranges were: fT3: 1.8-4.2 pg/mL, fT4: 0.87–1.85 ng/dL, TSH: 0.35–5.10 µIU/mL, and anti-TPO: <9 IU/mL. Overt hypothyroidism is defined as high TSH and low fT4 whereas subclinical hypothyroidism is characterized by high TSH and normal ft4. All parameters were analysed using Chemiluminescence Immunoassay (CLIA) on the Mindray CL 8000i analyser. Data were entered and coded in Microsoft Excel 2019 and exported and subsequently analysed using SPSS version 27. Descriptive statistics including frequencies, percentages and means were calculated. The Chi-square test was used to evaluate associations between categorical variables, and a p-value < 0.05 was considered as statistically significant.

Results

This study enrolled 73 hypothyroid patinets. Among them, 28(38%) patients had anti-TPO antibody positive while 45(62%) were negative for anti-TPO antibody.There were 29 patients with overt hypothyroidism with 41% positive TPO status. Out of 44 patients with subclinical hypothyroidism, 16(36%) were positive for anti-TPO antibody. However, this difference was not statistically significant (Chi-square = 0.186, p = 0.666).

Table 1: Prevalence of Anti-TPO antibody (n=73).

TPO status	Frequency(n)	Percentage(%)
Anti-TPO Positive	28	38
Anti-TPO Negative	45	62
Total	73	100

Table 2: TPO distribution in Overt and Subclinical hypothyroid patient (n=73).

Hypothyroid status	Anti-TPO antibody Negative(n)	Anti-TPO antibody Positive(n)	Chi-square value	Degree of freedom	p-value
Sub-clinical	28	16	0.18	1	0.66
Overt	17	12			

Table 3: Gender-wise distribution of hypothyroid patients and anti-TPO status (n=73).

Sex	Anti TPO antibody		Chi -square value	Degree of freedom	p-value
	Negative	Positive			
Female	36	23	0.05	1	0.82
Male	9	5			

Table 4: Age-wise distribution of hypothyroid patients and anti-TPO status (n=73).

Age group	TPO Status		Chi square value	Degree of freedom	p-value
	Negative	Positive			
18-29	7	7	5.48	4	0.24
30-39	9	10			
40-49	5	13			
50-59	7	10			
>60	-	5			

The mean age was 42.1 years (SD ±12.07), with the highest prevalence observed in the 30-39 years age group (26%). Female patients (81%) outnumbered males with a female to male ratio of approximately 4:1.

The gender-wise analysis revealed anti-TPO positivity in 23 out of 59 females (39%) and 5 out of 14 males (36%), with no statistically significant association (Chi-square = 0.051, p = 0.821). Age-wise distribution also showed no significant relationship with anti-TPO status (Chi-square = 5.48, p = 0.24).

Regarding clinical symptoms, the most frequently reported complaints included lethargy (43.80%), weight gain (43.20%), menorrhagia (42.30%), constipation (30.10%), decreased appetite (30.10%), and facial puffiness (26%). These symptoms were similarly distributed among anti-TPO positive and negative groups and had no significant association.

Discussion

Hypothyroidism is prevalent endocrine disorder in Nepal.[4] Iodine deficiency has been a concern for a landlocked country like ours. However, with the availability of iodized salt, the primary cause of hypothyroidism is shifting toward autoimmune phenomenon. This study was performed to determine the prevalence of autoimmune hypothyroidism and explore its correlation with demographic variables, type of hypothyroidism and common clinical symptoms.

In this study of 73 hypothyroid patients, 28(38%) patients were positive for anti-TPO antibody while 45(62%) patients were negative. Among anti-TPO antibody positive patients, 18% were male, and 82% were female. The mean age of anti-TPO-positive patients was 39.8 years as compared to 43.87 years in TPO-negative patients.

Similar study conducted at Gandaki Medical College Teaching Hospital by Paudel et al. revealed 37.50% of TPO positivity.[5] Shah et al. conducted a study of 50 hypothyroid patients in NAMS, Kathmandu where they found 28% prevalence of anti-TPO antibody.[6] Similar study conducted by Shrestha et al. found the prevalence of anti-TPO antibody around 27%.[7]

Since the study population shared common geographical distribution and similar socioeconomic status the results were almost similar to our study. Though further studies are required, we can conclude that around one third of hypothyroid population in our setting is attributable to autoimmunity. And our results are almost similar to the results of similar studies done across different countries. Unikrishnan et al. performed a cross-sectional multi-center study in eight major cities of India to observe the prevalence of autoimmune hypothyroidism. The study showed the prevalence of anti-TPO of around 21%.[8]

Anilkumar R et al. found 42% positive anti-TPO antibody in subclinical hypothyroid patients while 69.20% positive in overt hypothyroid patients.[9] Mahanta A et al. observed anti-TPO Ab in 53% of SCH.[10] Deshmukh V et al. reported anti-TPO Ab positivity in 47.60% of SCH subjects of the general urban population.[11] Jayshankar et al. found anti-TPO positivity in 80% and 40% in patients of SCH and OH respectively.[12] Jeena et al. found positive anti-TPO antibody in 60% of hypothyroid patients.[13]

Hence as compared to this study, the studies conducted at India had higher prevalence of anti-TPO antibody. The possible reasons could be due to different geographical characteristics, lifestyles and increased consumption of seafoods which are rich

in iodine. Moreover, the prevalences vary among the inland cities and coastal cities in India as well.

In our study 44(60.30%) patients had SCH and 29(39.70%) patients had OH. So, there was higher prevalence of SCH among the hypothyroid patients. Similar findings were reported by Jeena et al. identifying subclinical hypothyroidism as the most common thyroid disorder than overt hypothyroidism.[13] Khadka S et al. also had similar findings with SCH (56.30%) being more common than overt hypothyroidism.[14]

Marasini et al. involved 424 patients with thyroid disorder, found SCH as the common disorder 41.70% followed by euthyroidism at 34.70%, overt hypothyroidism at 20.30%, and overt hyperthyroidism at 3.30%.[15]

Hence, from the above studies we can conclude that SCH is more prevalent than OH. As most of the patients with SCH do not have specific clinical features, so most of them are not diagnosed. As evidenced by various studies, with time the SCH eventually progress to OH which is more frequent and rapid in patients with anti-TPO. Thus, it forms the basis for the importance of screening of thyroid disorder.

Similarly, this study revealed anti-TPO antibody positivity in 41% in OH and 36% in SCH. So, this finding indicates that the anti-TPO positivity reveals the disease progression. However, the finding was not statistically significant in our study (p=0.66) which is possibly due to small sample size and single center study. As mentioned earlier, CA et al. found that the prevalence of anti-TPO positivity was significantly higher in the clinical hypothyroidism group (80%) compared the subclinical group (50%). 12 Jain et al. also found higher anti-TPO prevalence in OH (70.30%) than the SCH (51.50%).[16] Shimizu et al. observed the prevalence of subclinical hypothyroidism was significantly associated with anti-thyroid peroxidase (anti-TPO) antibodies.[17] Sharma et al. found 58.30% of patients with SCH positive for anti-TPO antibodies.[18]

The results draws our attention regarding anti-TPO as predictive marker for more advanced thyroid dysfunction. The prevalence of anti-TPO antibodies among SCH and OH is variable in different studies. However, it can be concluded that the presence of anti-TPO predicts the progression of severity of hypothyroidism as evidenced by various studies.

Our study observed that hypothyroidism was more common in females (81%) compared to males (19%), with a female to male ratio of approximately 4:1. Among the females, 23 out of 59 were positive for anti-TPO antibodies while 5 out of 9 males were positive for anti-TPO antibodies. Despite the numerical difference in the prevalence of both hypothyroidism and anti-TPO antibodies between genders, the result was not statistically significant (p = 0.8211).

A similar study conducted by Paudel K et al. found comparable results with 88 patients in total with 13(16%) males and 75(84%) females.[5] Another retrospective study done by Yadav et al. at Charak Hospital, Pokhara involving 1,504 individuals from the general population, showed that 1,155 (76.80%) were females and 349 (23.20%) were males.[19] Marasini et al. involved 424 patients with thyroid disorder , with 73.80% female and 26.20% male, SCH was common disorder 41.70%.[15] Shrestha et al. reported 26.70% participants with positive anti-TPO antibody in which 83.40% were female and the rest were men.[7] One study also showed that women had a greater prevalence of anti-TPO antibodies than men, (65% vs 35%) aligning with global trends in autoimmune thyroid disorder.[18]

From all the above studies, it is evident that hypothyroid and autoimmunity is more prevalent in females than the males. Regarding the prevalence of hypothyroid disorder in female may be due to frequent blood investigations during conception and pregnancy. Also, TFT is frequently monitored during menstrual abnormalities. For the prevalence of the autoimmunity, the hormonal effects of Estrogen and the genes present in the X chromosome, could be the possible explanations.

In our study most of the patients were from 30-39 years followed by the 40-49 age groups. Hence the middle-aged population were most affected. The mean age of the patients was 42.12 years. A similar study conducted by Shah et al. at Bir Hospital, Kathmandu, among 50 patients over the age of 18, reported a mean age of 41.10 years for hypothyroid patients, which closely aligns with the findings of our study.[6] In our study, the most common symptoms of hypothyroidism were weight gain (n=33), lethargy (n=32), menorrhagia (n=25), constipation (n=22), decreased appetite (n=22), and tingling sensations (n=18). Other symptoms included hair fall, dry skin, insomnia, and swelling of the lower limbs. Similar study done by Shah et al. described frequent findings being lethargy, weight gain, facial puffiness, non-pitting edema, and neck swelling.[6]

A similar study performed by Paudel et al. at Gandaki Medical College Teaching Hospital, Pokhara, Nepal, reported with the most common symptoms being lethargy, cold intolerance, constipation, tingling sensations, and weight gain, while the most frequent signs included facial puffiness and non-pitting pedal edema.[5] These findings closely resemble with our results.

As a well-known fact, hypothyroidism lacks specific clinical features. This similarity emphasizes the importance of focusing on these predominant symptoms and signs during the clinical evaluation of hypothyroid patients. Early identification of these features could aid in prompt diagnosis and management, especially in resource-limited settings where advanced diagnostic tools may not be readily available.

Conclusions

This study concluded that more than one-third of hypothyroid patients were positive for anti-TPO antibody. Statistically significant correlation was not found between overt and subclinical hypothyroidism with anti-TPO antibody. Also, statistical significance was not found in terms of age-groups, gender, common clinical features, and anti-TPO antibody.

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