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Original Article

Demographic and Clinical Characteristics of Childhood Autoimmune Thyroiditis: Single-Center Study

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ABSTRACT

Aim: This study aimed to evaluate the clinical characteristics of pediatric patients diagnosed with autoimmune thyroiditis (AIT) at a tertiary healthcare center.

Materials and Methods: We conducted a retrospective study of 155 children diagnosed with AIT at a pediatric endocrinology clinic between January 1st, 2014 and December 31st, 2022. Clinical data were obtained through a comprehensive medical record review.

Results: The study population showed a strong female predominance (87.7%), with most patients (78.1%) being 10 years or older at diagnosis. The most common presenting symptom was neck swelling (23.2%), while 38.7% were asymptomatic at diagnosis. A family history of thyroid disease was present in 37.4% of the cases, and the majority of patients (76.0%) were pubertal at diagnosis. Thyroid function at presentation revealed subclinical hypothyroidism in 40.0%, euthyroidism in 33.5%, overt hypothyroidism in 22.6%, and hyperthyroidism in 3.9% of the patients. Anti-thyroid antibodies (anti-thyroid peroxidase and anti-thyroglobulin) were positive in 67.1% of the patients for both antibodies, with 92.9% positive for at least one antibody. Thyroid ultrasonography showed features compatible with AIT in 93.1% of those patients who underwent imaging. L-thyroxine treatment was initiated in 68.4% of the patients either at diagnosis or during follow-up. After a median follow-up period of 1.79 years (range 0-8.93), treatment was discontinued in five patients with overt hypothyroidism, three of whom achieved sustained euthyroidism while one developed subclinical hypothyroidism. Some patients with subclinical hypothyroidism showed spontaneous recovery of thyroid function.

Conclusion: Pediatric AIT demonstrates variable presentations and dynamic thyroid function changes, necessitating personalized monitoring.

Keywords: Autoimmune thyroiditis, Hashimoto's thyroiditis, autoimmunity, thyroid dysfunction

Introduction

Autoimmune thyroiditis (AIT) is the leading cause of hypothyroidism in iodine-sufficient regions worldwide (1). It represents the most common etiology of acquired thyroid dysfunction in the pediatric population, especially after the age of six years (2). The prevalence of chronic AIT in childhood peaks in early to mid-adolescence, with a female-to-male predominance of approximately 2:1. Although presentation before three years of age is rare, cases have been documented even in infancy (3).

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AIT develops in genetically predisposed individuals due to environmental triggers. A strong genetic component is evident, with antibody positivity observed in approximately 50% of first-degree relatives and concordance rates of 30-60% reported in monozygotic twins. The autoimmune process is mediated by antibodies targeting thyroid antigens, primarily anti-thyroid peroxidase (anti-TPO) and anti-thyroglobulin (anti-Tg), while thyroid-stimulating hormone (TSH) receptor-blocking antibodies are detected less frequently. The histopathological hallmarks of AIT include lymphocytic infiltration, lymphoid germinal centers, and the destruction of thyroid follicles, with intrathyroidal lymphocytes consisting predominantly of T and B cells (2).

Patients with AIT often present with an asymptomatic goiter. In many cases, abnormal thyroid function is discovered incidentally during laboratory screening. Affected individuals may be euthyroid, hypothyroid or, less commonly, hyperthyroid (2,3). Although AIT diagnosis is typically based on the clinical features of hypothyroidism and thyroid autoantibody positivity, seronegative forms occur in 5-10% of cases. In such instances, thyroid ultrasonography plays a critical role in diagnosis (4). Characteristic ultrasonographic findings include decreased echogenicity, parenchymal heterogeneity, increased vascularity, and small cystic formations (5).

We aimed to evaluate the auxological, biochemical, and radiological findings and treatment responses of children and adolescents with AIT at a tertiary health center. Patients were categorized based on their thyroid function tests and pubertal status in order to compare their clinical and laboratory characteristics among subgroups.

Materials and Methods

This retrospective study was conducted at a tertiary care center and included 155 pediatric patients diagnosed with AIT between January 1st, 2014, and December 31st, 2022. The study protocol was approved by the Fırat University Non-Interventional Research Ethics Committee (decision no.: 23529; dated: 04.04.2024). Informed consent was waived due to the retrospective design of this study.

Auxological, biochemical, radiological, and treatment-related data were extracted from the medical records. The collected variables included age at presentation, sex, presenting symptoms, family history of thyroid disease, coexisting autoimmune conditions, body weight standard deviation scores (SDS), height SDS, body mass index (BMI) SDS, pubertal stage, goiter grade, thyroid function tests [TSH, free thyroxine (FT4)], anti-Tg, anti-TPO, thyrotropin receptor antibody (TRAb), thyroid ultrasonographic findings, treatment details, and follow-up outcomes.

Height, weight, and BMI SDS were calculated using national reference data for Turkish children (6). Pubertal staging was assessed according to the Tanner criteria. Thyroid gland size was evaluated by palpation and classified by goiter grading. Institutional laboratory reference intervals were 0.89-1.76 ng/dL for FT4 and 0.5-5.5 mIU/L for TSH.

The diagnosis of AIT was established based on the presence of thyroid autoantibodies (anti-TPO and/or anti-Tg) and/or characteristic ultrasonographic findings. In seronegative cases, typical sonographic features (e.g., decreased echogenicity, parenchymal heterogeneity, pseudonodular appearance, or increased vascularity) supported the diagnosis. For those patients presenting with hyperthyroidism, TRAb levels were measured in order to differentiate AIT from Graves' disease.

The patients were classified into four groups based on their thyroid function at presentation; overt hypothyroidism, subclinical hypothyroidism, euthyroidism, or hyperthyroidism. Due to the small number of hyperthyroid cases, overt and subclinical hyperthyroidism were combined into a single group for analysis. Pubertal status was recorded, and the participants were stratified into prepubertal and pubertal subgroups for comparative analyses.

L-thyroxine (L-T4) treatment was initiated in those patients with overt or subclinical hypothyroidism, as well as euthyroid cases with compressive symptoms or significant goiter. Discontinuation of L-T4 therapy was considered in three scenarios: (1) patients maintained on very low-dose L-T4 with normalized TSH after titration; (2) non-adherent patients with normal thyroid function tests after discontinuation; or (3) euthyroid patients treated for goiter who showed regression of thyroid enlargement.

Statistical Analysis

Data were analyzed using IBM Statistical Package for the Social Sciences (version 22.0). Normally distributed continuous variables were expressed as mean ± standard deviation, non-normally distributed variables as median (range), and categorical variables as frequencies (%). Group comparisons were performed using the Mann-Whitney U test (non-parametric data), the chi-square test (categorical variables), and Kruskal-Wallis test. A p-value <0.05 was considered statistically significant.

Results

Among the 155 children diagnosed with AIT, 136 (87.7%) were female, resulting in a female-to-male ratio of 7.2:1. The majority of the patients (78.1%) were over 10 years of age with the median age at presentation being 13.1 years (range: 1.2-17.9).

The most common presenting complaints were abnormal thyroid function tests or the detection of thyroid autoantibodies during routine screening (60 patients, 38.7%). Other commonly seen symptoms were neck swelling (36 patients, 23.2%), hair loss (15 patients, 9.7%), fatigue (8 patients, 5.2%), weight gain (6 patients, 3.9%), as well as other symptoms such as tachycardia, tremor, irritability, or short stature (23 patients, 14.8%).

An evaluation of comorbidities showed that 106 patients (68.4%) had no accompanying diseases. The most common associated conditions included type 1 diabetes mellitus (6 patients, 3.9%), vitiligo (4 patients, 2.6%), asthma (4 patients, 2.6%), alopecia areata (3 patients, 1.9%), Down's syndrome (3 patients, 1.9%), epilepsy (3 patients, 1.9%), celiac disease (2 patients, 1.3%), autoimmune polyglandular syndrome (1 patient, 0.6%), and other disorders (21 patients, 13.6%).

A positive family history of thyroid disease was identified in 37.4% of the patients. Among these, the most frequently reported conditions were goiter (56.9%), AIT (17.2%), hypothyroidism (12.0%), unspecified thyroid disorders (6.9%), hyperthyroidism (5.2%), and thyroid nodules (1.7%).

The median weight SDS was 0.14 (range: -2.10 to 3.77), median height SDS was -0.15 (range: -2.85 to 2.51), and median BMI SDS was 0.23 (range: -0.85 to 3.23). A total of 15 patients (9.7%) had a BMI SDS >2. On initial examination, goiter was detected in 80 patients (53.3%) and was absent in 70 patients (46.6%). The patient characteristics, including auxological parameters and thyroid function status at diagnosis, are summarized in Table I.

Thyroid function status at admission was categorized as subclinical hypothyroidism in 62 patients (40.0%), euthyroidism in 52 patients (33.5%), overt hypothyroidism in 35 patients (22.6%), and hyperthyroidism in 6 patients (3.9%) (Table I).

Table I. Characteristics of patients according to auxologic data and thyroid function tests at diagnosis

Parameter	Euthyroidism (n=52)	Subclinical hypothyroidism (n=62)	Overt hypothyroidism (n=35)	Hyperthyroidism (n=6)	p-value
Female/male	41/11	60/2	32/3	3/3	0.001
Age, years	13.7 (4.65-17.9)	12.5 (1.23-17.8)	13.3 (4.17-17)	9.7 (5.83-16.5)	0.084
Height SDS	-0.05 (-2.85-2.36)	-0.15 (-2.31-2.51)	-0.27 (-2.05-1.51)	-0.95 (-1.85-0.41)	0.328
Weight SDS	0.19 (-2.10-2.61)	0.10 (-1.71-3.77)	0.25 (-1.74-2.76)	-0,53 (-1.84-1.32)	0.686
BMI SDS	0.31 (-0.83-2.29)	0.18 (-0.82-3.23)	0.40 (-0.85-2.83)	-0.50 (-0.50-1.68)	0.409
TSH	3.22 (0.65-5.47)	9.6 (5.71-60.6)	89.7 (6.46-150)	0.01 (0.01-0.20)	<0.001
Free T4	1.17 (0.71-1.57)	1.05 (0.86-2.14)	0.61 (0.01-0.84)	1.72 (1.10-3.21)	<0.001
Anti-TPO positivity (n, %)	42 (80.8)	54 (87.1)	32 (91.4)	5 (83.3)	0.612
Anti-Tg positivity (n, %)	38 (73.1)	49 (79)	22 (62.9)	6 (100)	0.322
Pubertal (n, %)	38 (73.1)	45 (72.5)	22 (68)	3 (50)	0.140

BMI: Body mass index, SDS: Standard deviation score, Anti-TPO: Anti-thyroid peroxidase, Anti-Tg: Anti-thyroglobulin, TSH: Thyroid-stimulating hormone

Table II. Characteristics of patients in prepubertal and pubertal groups at diagnosis

Parameter	Prepubertal (n=35)	Pubertal (n=108)	p-value
Female/male	28/7	100/8	0.010
Age, years	8.02 (1.23-11.7)	13.9 (8.32-17.9)	<0.001
Height SDS	-0.10 (-2.31-2.51)	-0.16 (-2.05-2.36)	0.604
Weight SDS	0.17 (-1.84-2.28)	0.13 (-2.10-3.77)	0.807
BMI SDS	0.28 (-0.80-3.23)	0.19 (-0.85-3.14)	0.924
TSH	10.8 (0.01-150)	7.37 (0.01-150)	0.054
Free T4	1.05 (1.05-0.24)	1.04 (0.01-2.14)	0.807
Anti-TPO positivity (n, %)	31 (88.6)	92 (85.2)	0.189
Anti-Tg positivity (n, %)	25 (71.4)	81 (75)	0.691

BMI: Body mass index, SDS: Standard deviation score, Anti-TPO: Anti-thyroid peroxidase, Anti-Tg: Anti-thyroglobulin, TSH: Thyroid-stimulating hormone

Pubertal status at presentation was as follows: 35 patients (24%) were prepubertal, and 108 patients (76%) were pubertal. Goiter staging differed significantly between groups, with prepubertal patients most frequently having stage 2 goiter (22.9%) and pubertal patients predominantly exhibiting stage 1b (25.9%). This difference was statistically significant ($p<0.001$). However, no significant differences were observed in TSH levels, free T4, autoantibody presence, or ultrasonographic findings (Table II).

Thyroid autoantibody results at diagnosis revealed that anti-TPO antibodies were positive in 133 patients (85.8%), anti-Tg antibodies were positive in 115 patients (74.2%), and concurrent anti-TPO and anti-Tg positivity was observed in 104 patients (67.1%). At least one antibody was positive in 144 patients (92.9%). Notably, none of the hyperthyroid patients had detectable TRAb antibodies.

Thyroid ultrasonography was performed in 87 patients (56.1%) at presentation. Among these, 81 (52.3% of the total cohort) exhibited sonographic features consistent with AIT, yielding a positivity rate of 93.1% among those examined.

The median follow-up duration was 1.76 years (range: 0-8.93). L-T4 treatment was initiated in 68.4% of the patients, including all overt hypothyroid patients, 53 subclinical hypothyroid patients (85.4%), and 18 euthyroid patients (34.6%).

Among the 35 overt hypothyroid patients, 5 were evaluated during a treatment-free interval. Three (8.6%) achieved euthyroidism, 1 (2.9%) remained subclinically hypothyroid, and 1 required treatment reinitiation due to overt hypothyroidism. Of the 53 subclinical hypothyroid patients started on treatment, discontinuation was attempted in 7. Five achieved normalized thyroid function, while 2 persisted with subclinical hypothyroidism. Among the 9 untreated subclinical hypothyroid patients (TSH: 5.83-6.78 mIU/L), 4 became euthyroid and 5 remained subclinically hypothyroid. Of the 9 hyperthyroid patients at diagnosis, 7 achieved euthyroidism by their 3-month follow-up, while 2 developed subclinical hypothyroidism

Discussion

This study provides an extensive review of the clinical, biochemical, and ultrasonographic presentations of pediatric patients diagnosed with AIT over a nine-year period at a tertiary care center. Our results confirm well-documented patterns in the literature while also offering insights into the disease spectrum and its real-world management.

Consistent with previous reports, we observed a female predominance, with most patients being pubertal at diagnosis (median age of 13.1 years) (1-3). Approximately half of our patients presented with goiter, aligning with literature reports of 50-90% prevalence in pediatric AIT cases (7). Similar studies from Türkiye reported goiter in 54.9% and 49.4% of AIT cases (8,9). These findings underscore the importance of thorough physical examination and maintaining clinical suspicion for AIT even in asymptomatic children.

A family history of thyroid disease was present in nearly half of our patients, comparable to rates of 41.1% and 52% in other series (8,10). This reinforces the established genetic predisposition in AIT pathogenesis, likely resulting from complex gene-environment interactions (11). These findings highlight the importance of family screening and health education for first-degree relatives, potentially enabling earlier diagnoses. However, current guidelines lack definitive recommendations for AIT screening in at-risk children, suggesting that these patients should instead undergo regular monitoring during routine health visits.

Thyroid function at diagnosis varied among the patients. Subclinical hypothyroidism was most common, followed by euthyroidism and overt hypothyroidism, while hyperthyroidism was observed in very few cases. This distribution matches previous reports demonstrating that subclinical or overt hypothyroidism predominates in pediatric AIT (8,10,12-15). Notably, over half of our patients were hypothyroid at diagnosis, reflecting the often-insidious disease course and supporting periodic thyroid function screening in high-risk populations.

Autoantibodies are critical for making the diagnosis but are occasionally negative in a small percentage of patients. In our series, 7.1% of the patients were seronegative at the time of diagnosis but exhibited ultrasonographic features consistent with AIT. This again emphasizes the diagnostic use of thyroid ultrasonography, particularly in seronegative patients (5,15). Ultrasonographic findings typical of AIT, such as diffuse hypoechogenicity and heterogeneous parenchymal echotexture with a micronodular pattern, were observed in nearly all of those patients who were imaged at diagnosis, in accordance with superior rates of previously noted positivity of between 20 and 95%, depending on the diagnostic criteria and disease stage (8,16). In this study, 56.1% of the patients were imaged with ultrasound (US), and 52.3% of the sample had positive AIT features. These results are important in showing the value of US in supporting the diagnosis, especially when antibody testing is unremarkable.

Approximately one-third of patients had comorbid chronic conditions, particularly autoimmune disorders such as type 1 diabetes and vitiligo. This association supports the autoimmune pathogenesis of AIT and necessitates multidisciplinary management with screening for additional autoimmune diseases (7-9).

Regarding treatment, 68.4% received L-T4, similar to previous reports of 40-70% treatment rates in pediatric AIT (17-20). Indications primarily included overt or significant subclinical hypothyroidism, with some euthyroid patients treated for symptomatic goiter. Most treated hypothyroid patients achieved euthyroidism within months, while some untreated subclinical hypothyroid cases showed spontaneous recovery-though relapses occurred. These findings mirror prior studies demonstrating fluctuating thyroid function in pediatric AIT, highlighting the need for individualized long-term follow-up (10).

Study Limitations

This study's strengths include the large single-center cohort with extended observation periods, comprehensive analysis of auxological, biochemical, and ultrasonographic data, and clinically relevant stratification by pubertal status and thyroid function. Its limitations include its retrospective design which risks incomplete data and reporting bias, inconsistent baseline imaging/antibody testing which may affect diagnostic classification, and variable follow-up durations and attrition which limit its long-term outcome assessments.

Conclusion

In conclusion, this study demonstrates the heterogeneous clinical and biochemical presentation of pediatric AIT. The observed fluctuations in thyroid function, including spontaneous normalization in some hypothyroid patients, suggest that regular thyroid function monitoring is essential and temporary L-T4 discontinuation may be considered in selected cases under close supervision. An individualized, dynamic approach to treatment and follow-up is recommended for optimal pediatric AIT management.

Ethics

Ethics Committee Approval: Ethics approval was obtained from the Fırat University Non-Interventional Research Ethics Committee (approval no.: 23529 date: 04.04.2024).

Informed Consent: Informed consent was waived due to the retrospective design.

Footnotes

Authorship Contributions

Concept: E.Y., İ.E., D.Ö., Design: E.Y., İ.E., Data Collection or Processing: E.Y., Analysis or Interpretation: E.Y., İ.E., D.Ö., Literature Search: E.Y., Writing: E.Y., İ.E., D.Ö.

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