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Association of Thyroid Dysfunction and Autoantibody Abnormality with Vitiligo in Pediatric Patients: A Cross-Sectional Study

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ABSTRACT

Background: Vitiligo is a dermatological disorder characterized by functional melanocyte loss, affecting 1% of the global population. The prevalence and impact of thyroid hormone and autoantibody levels on pediatric patients with vitiligo remain unclear.

Aim: This study aims to assess the incidence of autoimmune thyroid disorder in pediatric vitiligo patients and investigate the impact of thyroid hormone and autoantibody levels on vitiligo activity.

Subjects and Methods: A total of 68 children with vitiligo participated in this cross-sectional study, which included measurements of thyroid function, autoantibody tests, and examinations of the patients' vitiligo type, duration, activity, and onset.

Results: Autoimmune thyroiditis was detected in 33.8% of patients. Positive anti-thyroglobulin antibodies were significantly associated with a family history, duration, and activity of vitiligo. Positive anti-thyroid peroxidase antibodies were significantly related to active vitiligo, sudden onset, and higher TSH levels. Anti-thyroglobulin antibodies correlated positively with age, duration, and TSH levels but negatively with T3 and T4 levels. Anti-thyroid peroxidase antibodies were positively correlated with TSH. Positive anti-thyroglobulin antibodies extended disease duration. Active vitiligo and rapid onset were more frequent with positive anti-thyroid peroxidase antibodies.

Conclusions: This study concluded that pediatric vitiligo patients, particularly females and those with a family history of autoimmune diseases, have a higher frequency of thyroid dysfunction and autoantibodies. Moreover, regular monitoring of thyroid function and autoantibodies among pediatric patients with vitiligo is important to detect progression to overt hypothyroidism. Consequently, practitioners should recognize and treat thyroid-related conditions early and be aware of the relationship between vitiligo and autoimmune thyroid disease.

Keywords: Vitiligo, Anti-Thyroglobulin Antibodies, Autoimmune Thyroid Disease, Thyroid Function Tests, Pediatric.

INTRODUCTION

Vitiligo is a type of autoimmune disorder that is acquired and characterized by the loss of functional melanocytes in the skin, leading to the development of large white patches on the skin [1]. Vitiligo impacts roughly 1% of the global population and accounts for 0.7%–4% of all dermatology clinic patients [2]. Vitiligo can impact individuals of all ages, with 50% of cases occurring below 20 years old and 25% being diagnosed before 10 years old. Although not a life-threatening condition, vitiligo can cause significant stress, low self-esteem, and difficulties in work and school settings, particularly for children and adolescents [1].

The precise etiology of vitiligo remains ambiguous; however, three principal hypotheses have been proposed. One of the prevailing theories posits that immune dysregulation results in atypical T-cell reactivity, which ultimately leads to the destruction of melanocytes. Evidence supporting the occurrence of the immune system in the pathogenesis of the disease provides the efficacy of immune modulatory agents, including corticosteroids and calcineurin inhibitors [3]. Previous studies have indicated that melanocytes may develop damage from an endogenous chemical toxin or an exogenous substance discharged from nerve endings, leading to a reduction in melanin synthesis [4].

In addition, potential factors such as loss of melanocyte growth factors and abnormalities in melanocyte structure or function have been proposed to contribute to the depigmentation process [5]. The detection of organ-specific autoantibodies and their complements in the sera of patients with vitiligo further supports the autoimmune nature of the disease [6].

Vitiligo is commonly associated with organ-specific autoimmune diseases such as alopecia areata, lichen planus, pernicious anemia, atopic dermatitis, Hashimoto's thyroiditis, hypothyroidism, endemic goiter, Graves' disease, diabetes mellitus, and Addison's disease [7]. However, vitiligo has a higher prevalence with thyroid diseases than with other autoimmune diseases, with up to 10.7% prevalence [8].

Several studies have been conducted to assess the correlation between vitiligo and thyroid function abnormalities and their autoantibodies to confirm this association. In a study by **Ingordo *et al.*** [9], circulating autoantibodies were observed in a large sample of Italian vitiligo patients, with variations in prevalence potentially attributable to ethnic differences or distinct triggering factors. Out of 146 people tested, 61 (41.8%) had at least one circulating autoantibody in their serum. The autoantibodies most commonly observed were anti-thyroperoxidase (25.6%), anti-thyroglobulin (23.4%), anti-nuclear antibodies (16.8%), and anti-gastric parietal cell antibodies (7.8%). A total of 74 (41.5%) autoimmune comorbidities, primarily autoimmune thyroiditis (37%), were reported.

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Another study by **Zettinig *et al.*** [10] that involved 108 cases and 34 controls found that Vitiligo patients had significantly higher autoimmune thyroiditis than controls. (21% vs. 3%; $P < 0.01$). The study also showed that autoimmune thyroiditis manifested simultaneously with or after the onset of vitiligo but not before it. According to a review conducted by **Prindaville and Rivkees** [11], the simultaneous development of vitiligo and Graves' disease is more commonly observed in younger children as opposed to older ones, with the average age of onset for thyroid disease being 4 ± 0.7 years. Furthermore, thyroid disease was often diagnosed subsequent to the diagnosis of vitiligo.

Subsequently, we aimed to determine the prevalence of autoimmune thyroid diseases in pediatric patients with vitiligo at Zagazig University and to assess the impact of thyroid hormone and autoantibody levels on the activity and characteristics of vitiligo.

SUBJECTS AND METHODS

The study was conducted in accordance with the outpatient clinic guidelines of Zagazig University Hospital.

Study Design and Sampling

The investigation was conducted as a cross-sectional observational study. Utilizing Epi-info software with a 95% confidence interval and study power of 80%, a sample size of 68 was calculated based on prior research indicating rates of 25.7%. The patients were assigned from the dermatology outpatient clinic according to the following inclusion criteria: age 2 to 18 years, Fitzpatrick skin types III to VI, non-segmental and mixed vitiligo, and provision of informed consent. Exclusion criteria were: age > 18 years, history of other autoimmune diseases, other dermatological disorders, segmental vitiligo, and current immunosuppressive treatment.

All patients were exposed to the following:

a. ***Complete history taking***

The study participants and their parents were asked to provide personal history details, encompassing but not limited to age, residential situation, economic standing, dietary patterns, familial history of similar diseases, as well as any previous medical history of prescription drug use, minor trauma, psychological stress, and surgical interventions.

b. A comprehensive physical examination

A comprehensive physical examination was conducted to identify any potential diseases or conditions affecting the body's structures and immune system.

c. Detailed dermatological investigation

This investigation includes type, size, evaluation, state of vitiligo, and scoring framework examination upheld by Wood light to assess the degree, stage, and movement of vitiligo. In addition, it determined the beginning, course, duration, and appropriation of the disease and other related dermatologic diseases.

Laboratory investigations: The serum samples were gathered and subsequently stored at a temperature of -20 °C until the time of analysis. The thyroid function tests that were conducted comprised of free triiodothyronine (FT3), free thyroxine (FT4), thyroid stimulating hormone (TSH), thyroglobulin antibody (TgAb), and thyroid peroxidase antibody (TPOAb), which were analyzed using radioimmunoassay and immunochemiluminometric assay.

Thyroxine (T4) Radioimmunoassay: A commercial 125I-T4 radioimmunoassay was utilized following the manufacturer's guidelines (Skybio Ltd, Wyboston, Beds. UK).

Triiodothyronine (T3) Radioimmunoassay

A commercial 125I-T3 radioimmunoassay was utilized following the manufacturer's guidelines (Skybio Ltd).

Thyroid Stimulating Hormone (TSH) Immunochemiluminometric assay: A third-generation TSH immunochemiluminometric assay was utilized according to the manufacturer's guidelines (Nichols Institute Diagnostics, San Juan Capistrano, CA).

Thyroglobulin Autoantibody (TgAb) and Thyroid Peroxidase Autoantibody (TPOAb) Assays

Commercial 125I radioimmunoassays were utilized to detect TgAb and TPOAb according to the manufacturer's guidelines (RSR Ltd).

Ethical approval:

This experiment was ethically approved by the Faculty of Medicine, Zagazig University's. Before recruitment in the study, informed written agreement was sought from the parents of all children participants after outlining the work's aims. The study was conducted out in line with the Helsinki Declaration.

Statistical analysis:

All analyses were done utilizing SPSS V.18 (Chicago, USA). Quantitative data were represented as mean ± standard deviation (SD), median, and range. Qualitative data were represented as numbers and percentages. Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data).Chi square test ($\chi 2$) to calculate difference between two or more groups of qualitative variables. P value < 0.05 was considered statistically significant.

RESULTS

The research sample comprised individuals aged between 3 to 18 years, with a mean age of 10.35 years, and a majority of female participants (61.8%), as presented in **Table 1**.

Table (1): Demographic characteristics of the included patients

Variable	**(n=68)**	
Age: (year) Mean ± SD Median Range	 10.35 ± 3.46 10 3 – 18	
Variable	**No**	**%**
Sex: Female Male	 42 26	 61.8 38.2

The study revealed that a significant proportion (33.8%) of vitiligo patients exhibited thyroid dysfunction. Specifically, 30.9% of the patients had anti-thyroid peroxidase antibodies (> 35 IU/mL), 5.9% had anti-thyroglobulin antibodies (> 115 IU/mL), and 2.94% had both types of antibodies positive. The classification of autoimmune thyroiditis was based on the levels of thyroid hormone and the status of antibodies. The observed distribution of cases is shown in **Table 2**.

Table (2): Laboratory findings and clinical diagnosis of pediatric vitiligo patients with abnormal thyroid function tests or antibodies

Number of patients	**FT3**	**FT4**	**TSH**	**TgAb**	**TPO-Ab**	**Clinical diagnosis**	**%**
4	normal	normal	high	negative	negative	subclinical hypothyroidism	5.88
3	normal	normal	low	negative	negative	subclinical hyperthyroidism	4.4
1	normal	low	high	negative	negative	hypothyroidism	1.47
3	normal	high	low	negative	negative	hyperthyroidism	4.4
6	normal	low	high	negative	positive	hypothyroidism+autoimmune thyroiditis	8.82
2	normal	low	high	positive	negative	hypothyroidism+autoimmune thyroiditis	2.94
9	normal	normal	normal	negative	positive	euthyroidism+autoimmune thyroiditis	13.24
3	normal	normal	high	negative	positive	subclinical hypothyroidism +autoimmune thyroiditis	4.4
2	normal	high	low	positive	positive	hyperthyroidism+autoimmune thyroiditis	2.94
1	normal	high	low	negative	positive	hyperthyroidism+autoimmune thyroiditis	1.47

Based on the findings of a family-related medical history analysis, a majority of 48.5% of the subjects did not exhibit any indications of autoimmune disorders. However, a significant proportion of 14.7% of the participants had a history of such disease, with maternal hypothyroidism being the most frequently reported diagnosis. Furthermore, a significant proportion of the participants (41.2%) reported having a familial predisposition to vitiligo, with the greatest prevalence observed among their other relatives (17.6%) and siblings (10.3%). The study observed a range of disease duration spanning from 1 month to 14 years, with a calculated mean of 2.91 years and a mean score of 2.51. The study findings indicate that a majority of patients, specifically 51.5%, exhibited a gradual onset of symptoms. Additionally, a significant proportion of patients, specifically 79.4%, were presented with active disease. The prevalent forms of vitiligo were acrofacial (35.3%) and vulgaris (33.8%), as indicated in **Table 3**.

Table (3): Family history and disease data among the studied group

Variable	(n=68)	
	No	**%**
Family history:		
No	33	48.5
Yes of vitiligo	28	41.2
Parents	5	7.4
Sister and Brother	7	10.3
Grandfather and mother	1	1.5
Uncles and aunt	6	8.8
Other Relatives	12	17.6
Yes of other autoimmune disease	10	14.7
Alopecia areata in Father	1	1.5
Hypothyroid in the mother	6	8.8
Hypothyroid in aunt	1	1.5
Psoriasis in the mother	1	1.5
Psoriasis in relative	1	1.5
Variable	**(n=68)**	
Duration: (year)		
Mean ± SD	2.91 ± 2.5	
Median	2.25	
Range	One month –14	
Score:		
Mean ± SD	2.51 ± 1.11	
Median R	2	
Range	0 – 4	
Variable	**No**	**%**
Onset:		
Gradual	35	51.5
Sudden	33	48.5
Stability:		
Active	54	79.4
Stable	14	20.6
Type:		
Acrofacial	24	35.3
Focal	14	20.6
Generalized	1	1.5
Universalis	6	8.8
Vulgaris	23	33.8

The levels of thyroid hormones in the group under investigation were measured and recorded. The study observed anti-thyroglobulin levels within a range of 10 to 500 IU/mL, with a mean value of 36.83 IU/mL. A total of 5.9% of the patients exhibited positive antibodies. The study reported a range of anti-peroxidase levels between 7.4 to 1300, with 30.9% of patients exhibiting positive antibodies, as presented in **Table 4**.

Table (4): Thyroid function and anti-thyroid antibody tests among the studied group

Variable	(n=68)
TSH: (mIU/L)	
Mean ± SD	2.52 ± 0.54
Free T3: (ng/dL)	
Mean ± SD	4.42 ± 1.07
Free T4: (ng/dL)	
Mean ± SD	1.46 ± 0.34
Variable	**(n=306)**
Anti-thyroglobulin: (IU/mL)	
Median	16.13
Range	10 – 500
Frequency:	
-ve (< 116 IU/mL) N(%)	64 (94.1%)
+ve (≥116 IU/mL) N(%)	4 (5.9%)
Anti-peroxidase: (IU/mL)	
Median	28
Range	7.4 – 1300
Frequency:	
-ve (<35 IU/mL) N(%)	47 (69.1%)
+ve (≥35 IU/mL) N (%)	21 (30.9%)

Median and range: Non-parametric test.

There were no significant statistical variations observed in terms of age, gender, incidence of other autoimmune disorders, and familial medical history between patients who tested positive for anti-thyroglobulin antibodies and those who did not. The duration of the disease was found to be significantly higher in individuals who tested positive for the condition in comparison to those who tested negative. The study found that positive cases exhibited significantly elevated levels of anti-thyroglobulin and anti-peroxidase, while no significant differences were detected in TSH, T3, and T4 levels, as demonstrated in **Table 5.**

Table (5): Comparison between cases that had +ve anti-thyroglobulin antibodies and cases that did not have disease data with thyroid function and antibody level.

Variable	-ve (n=64)	+ve (n=4)	MW	P
Duration: (year)				
Mean ± SD	2.73 ± 2.39	5.75 ± 2.87		
Median	2	4.5	2.39	0.01*
Range	One month – 14	4 – 10		
Score:				
Mean ± SD	2.47 ± 1.11	3.25 ± 0.96		
Median	2	3.5	1.36	0.20 NS
Range	0 – 4	2 – 4		
Variable	**-ve (n=64)**	**+ve (n=4)**	**Test**	**P**
TSH: (mIU/L)				
Mean ± SD	2.56 ± 0.28	1.95 ± 0.47	MW 0.87	0.40 NS
Free T3: (ng/dL)				
Mean ± SD	4.46 ± 1.06	3.83 ± 0.3	t 1.15	0.26 NS
Free T4: (ng/dL)				
Mean ± SD	1.47 ± 0.37	1.22 ± 0.29	t 1.33	0.19 NS
Anti-thyroglobulin:(IU/mL)				
Median (Range)	15.4 (10 – 93.55)	226.2 (150 – 500)	MW 3.04	0.001**
Anti-peroxidase: (IU/mL)				
Median (Range)	28 (7.4 – 1008.8)	477.9 (28 – 1300)	MW 1.99	0.04*

Median and range: Non-parametric test.

A statistically significant increase in the frequency of positive family history was reported among patients with positive anti-thyroglobulin antibodies. Positive cases exhibited a significantly higher prevalence of active cases and sudden onset, while no significant differences were observed in disease duration, score, and type. A significant positive correlation was identified between anti-thyroglobulin and age, duration, and TSH, while an inverse correlation was identified between anti-thyroglobulin and T3 and T4. **Table 6** displays a significant strong association between anti-peroxidase and TSH.

Table (6): Correlation between anti-thyroglobulin and anti-peroxidase antibodies and age, duration, score, and thyroid function tests among the studied group

Variable	Antithyroglobulin (n = 68)		Anti-peroxidase (n=68)	
	r	P	r	P
Age (years)	0.25	0.04*	0.06	0.63 NS
Duration (years)	0.24	0.04*	0.20	0.10 NS
Score	0.10	0.41 NS	-0.10	0.40 NS
TSH: (mIU/L)	0.32	0.008**	0.35	0.004**
Free T3: (ng/dL)	-0.42	<0.001**	0.23	0.06 NS
Free T4: (ng/dL)	-0.49	<0.001**	0.11	0.37 NS
Anti-peroxidase: (IU / ml)	0.06	0.63 NS	---	---

To summarize, the findings suggest a significant association between thyroid dysfunction and vitiligo in pediatric patients, exhibiting diverse clinical manifestations and interrelationships between antibody levels and disease features.

DISCUSSION

Vitiligo is a dermatological condition that is characterized by the gradual depletion of melanocytes, resulting in the development of well-defined, milky-white macules [12]. The histopathological examination of the disease demonstrates a near-complete absence of melanocytes in the basal layer of the affected skin, accompanied by the presence of inflammatory cells in the dermis [13]. This condition has a significant impact on the patient's psychological well-being and overall quality of life [14]. Vitiligo can be categorized into three distinct groups based on clinical presentation. These groups include segmental vitiligo (SV), non-segmental vitiligo (NSV), and mixed vitiligo (MV). The term "mixed" is used to describe cases where SV initially occurs, followed by the appearance of bilateral patches of NSV after several months [12].

Autoimmune vitiligo is presented mainly by non-segmental vitiligo in genetically predisposed persons, and there are several factors related to the onset of the disease, including sunburn, exposure to phenolic chemicals, pregnancy, psychological stress, and cutaneous trauma (Koebner phenomenon) [15]. Various epidemiological studies have demonstrated a significant correlation between vitiligo patients and several types of other autoimmune disorders [12]. The diagnosis of vitiligo cases is often observed in patients with a medical history of autoimmune diseases, including pernicious anemia, systemic lupus erythematosus, type 1 diabetes, psoriasis, rheumatoid arthritis, inflammatory bowel diseases, and autoimmune thyroid disease [16,17]. However, the predominant correlations of vitiligo are primarily observed in the context of autoimmune thyroid disorders [18,19]. Lymphocytic infiltration has been observed in the thyroid parenchyma of patients with autoimmune thyroid diseases [20]. In addition, skin biopsies obtained from individuals with vitiligo reveal the presence of lymphocytic infiltration in both the dermal and epidermal layers. This infiltration comprises activated T cells that are believed to be accountable for the destruction of melanocytes [21].

In order to discover anti-thyroid autoantibodies and estimate the incidence of autoimmune thyroid disease in children with vitiligo, the current study intended to assess the serum levels of TSH, FT3, FT4, TPOAb, and TgAb in 68 children diagnosed with the condition. The study's demographic data related to gender and age indicate that the female participants constituted 61.8% of the sample, while the male participants constituted 38.2%. In a previous study, similar findings were provided as follows: 63.3% female and 36.7% male [3]. The mean age of the patients in the previous study was 8.19 ± 3.45 years, while the mean age of our study was 10.35 ± 3.46.

In this work, we detected that the total number of abnormalities in thyroid function and autoantibodies was 34 (50%) (this includes abnormalities in any one of the following parameters: TSH, T4, T3, anti-TPO, and anti-Tg ab), while the number of patients with abnormal levels of anti-thyroid peroxidase antibody and anti-thyroglobulin antibody was 21 (30.9%) and 4 (5.9%) respectively, of the total of 68 vitiligo patients, and there were two patients who had abnormalities in both antibodies, so vitiligo children patients with abnormal anti-thyroid antibodies were 23 (33.8%). Our results confirm the association of autoimmune thyroid antibodies with pediatric patients with vitiligo more than a prevalence study conducted on 79 vitiligo children, where the prevalence of thyroid dysfunction and autoantibody abnormalities was lower than our finding of approximately 25.3% found in 20 patients, and thyroid autoantibody abnormalities presented in nine patients (11.3%) [3]. Also, our results, are in

agreement with a study done by **Xianfeng *et al.*** [1], where about 63 patients (43.4%) displayed abnormalities in thyroid function, but the positivity of Tg-Ab, and TPO-Ab antibodies together were presented in a total of seven patients (4.8%).

Another study conducted over 155 pediatric patients with vitiligo agreed with our findings but at a lower prevalence rate. Of these patients, 34 (22%) had one or more thyroid parameters converted, and 18 (12%) had elevated antibodies. All of these patients were NSV [22]. Our study showed a higher rate of association than previous studies because we considered our age group below 18 years, while some studies took their age group from 2 to 15 years; in addition to the geographic and socioeconomic differences, when we choose patients, vitiligo activity was considered, non-segmental vitiligo, and patients did not take immunosuppressive agents.

Some studies show different findings from these previously confirmed associations between vitiligo and autoimmune thyroid disease. In case and control studies conducted on children < 12 years, the study showed that a case from 50 vitiligo patients had a higher TSH titer and a case from the control group/40 controls had a higher TSH titer, while antibodies were negative for both groups, their study demonstrated an insignificant association between vitiligo and autoimmune thyroid disease (ATD) [23].

The term subclinical hypothyroidism pertains to elevated levels of TSH while maintaining normal serum levels of total or free T3 and T4 when discussing other abnormalities in the thyroid profile [24]. Subclinical hypothyroidism is diagnosed by laboratory findings without associated symptoms [25]. Continuous follow-up of subclinical hypothyroidism has caused the development of overt hypothyroidism at a rate of 5% to 20% every year, mainly in autoimmune thyroiditis [26]. In our investigation, subclinical hypothyroidism was found in seven patients (10.29%), four of whom had autoantibodies and three of whom did not. Three individuals (4.4%) who had subclinical hyperthyroidism but no aberrant autoantibody levels were also found.

In a research by **Afsar and Isleten** [3], the term "subclinical hypothyroidism" also produced similar findings; ten (12.6%) patients exhibited this condition. However, others demonstrate a decline in prevalence in their surveys: one study found that the prevalence of subclinical hypothyroidism was less than 2% in children [27], 4.1% in a study by **Xianfeng *et al.*** [1], and 0.65% in a study by **Kartal *et al.*** [22]. Then our results will suggest the screening of pediatric patients with vitiligo to analyze thyroid function and thyroid autoantibody assays. Anti-Tg ab and anti-TPO were shown to be present in autoimmune thyroid disorders at significantly higher levels compared to controls and up to seven years before clinical diagnosis [28].

In this study, the vitiligo family history was 41.2%, and other autoimmune family history diseases were 14.7%, most frequently hypothyroidism in mothers. There was a statistically significant increase in +ve vitiligo family history among anti-peroxidase +ve cases (p-value 0.03), which means that patients with vitiligo with a family history are more prone to develop anti-TPO in their sera. This result will support the genetic role in the inheritance of humoral immunity. The observed significance of a family history of vitiligo in our study group exceeds that of **Kartal *et al.*** [22], wherein the family history of vitiligo was identified in 14 (9%) of the patient cohort with offspring.

Gender-related data showed that women affected by vitiligo/NSV are more likely to experience autoimmune thyroid disorders than men affected. In our study, positive cases of autoantibodies (anti-TPO and anti-Tg): 15 were women, and 8 were men. In another study, 18 patients developed positive thyroid autoantibodies, 14 were girls, and 4 were males. Our findings are consistent with previous studies that have reported a higher prevalence of autoimmune thyroid disease (ATD) in vitiligo women compared to males [22]. In our study, the most frequent type of vitiligo in patients with positive Anti-TPO and anti-TG was the acrofacial type (38.1%) and (75%), respectively. In our study, the duration of the disease was more prolonged in patients with vitiligo with positive anti-Tg. This could mean that the prolonged course of vitiligo can develop autoimmune thyroglobulin antibodies (p value=0.01). Additionally, statistical significance increased in patients with active disease and sudden onset among positively anti-TPO patients. The statistical significance of activity and onset of vitiligo were (p-value 0.03) and (p-value 0.04), respectively, and this was interpreted as patients when their disease was active and accompanied by sudden onset characterized by the presence of autoantibody TPO.

In our study, a high TSH level (hypothyroidism) was indicated to increase among cases of vitiligo that have positive anti-TPO (P value 0.03). The increased age, duration of the disease, and level of TSH were also observed to be of increased significance with cases of vitiligo of positive anti-Tg. The deceased levels of T4 and T3 showed negative significance in patients with positive anti-Tg.

CONCLUSIONS

In summary, our research provides insight into the associations between vitiligo and autoimmune thyroid disorder in the pediatric demographic. The present study affirms the elevated incidence of thyroid dysfunction and autoantibody anomalies in children diagnosed with vitiligo, particularly in the female demographic and those with a familial background of autoimmune disorders. The findings of our study underscore the significance of consistent surveillance of thyroid function and autoantibodies in children with

vitiligo as a means of identifying the possible development of overt hypothyroidism in the course of the disease. In brief, our research highlights the necessity for heightened recognition among medical professionals of the complicated correlation between vitiligo and autoimmune thyroid disease. Additionally, it emphasizes the significance of prompt identification and treatment of possible thyroid irregularities to enhance patient outcomes and quality of life.

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