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To Investigate the Prevalence of Thyroid Function test Anomalies and Serum Thyroid Autoantibodies in Individuals with Vitiligo and Alopecia Areata

Mamta Rani[1]

[1]Department of Dermatology, Rama Medical College, Hapur, UP, India.

Abstract

Background: Alopecia areata (AA) and vitiligo are autoimmune disorders defined by the loss of hair and the presence of depigmented patches on the skin, respectively. It is often linked to other autoimmune illnesses, particularly autoimmune thyroid disorders, suggesting that autoimmunity may play a role in its development. **Aim:** To investigate the prevalence of thyroid function test anomalies and serum thyroid autoantibodies in individuals with vitiligo and alopecia areata. **Methodology:** A total of 160 patients were allocated into two groups, with 80 patients assigned to the AA group and 80 patients assigned to the vitiligo group. We retrieved demographic information, clinical features, and test findings of the patients from our system. All patients underwent analysis of thyroid function tests, including free T3, free T4, and TSH, as well as blood levels of thyroid autoantibodies (Anti-TG and anti-TPO). This research was done in compliance with the ethical criteria and received approval from the ethics committee. **Results:** The mean levels of free T3, free T4, and TSH were not significantly different between the AA and vitiligo groups. The mean free T3 levels were 4.23 ± 0.88 pmol/L in the AA group and 4.43 ± 0.93 pmol/L in the vitiligo group (p=0.15). Similarly, the mean free T4 levels were 16.58 ± 1.46 pmol/L in the AA group and 16.98 ± 1.45 pmol/L in the vitiligo group (p=0.21). The mean TSH levels were 2.07 ± 0.77 mIU/L in the AA group and 2.21 ± 0.75 mIU/L in the vitiligo group (p=0.11). Elevated TSH was observed in 7.5% of AA patients and 10% of vitiligo patients (p=0.14), while suppressed TSH was observed in 8.75% of AA patients and 6.25% of vitiligo patients (p=0.22). Elevated free T3 was found in 5% of AA patients and 3.75% of vitiligo patients (p=0.15), and suppressed free T3 in 1.25% of AA patients and 2.5% of vitiligo patients (p=0.21). Elevated free T4 was observed in 6.25% of AA patients and 5% of vitiligo patients (p=0.16), while suppressed free T4 was found in 2.5% of AA patients and 3.75% of vitiligo patients (p=0.11). Positive Anti-TG antibodies were found in 25% of AA patients and 22.5% of vitiligo patients (p=0.31), while positive Anti-TPO antibodies were found in 22.5% of AA patients and 20% of vitiligo patients (p=0.70). **Conclusion:** The study's findings on decreased thyroid functioning and thyroid autoantibodies in individuals with vitiligo and AA were in line with prior data collected from other ethnic communities.

Keywords: Vitiligo, AA, Thyroid disease, Thyroid autoantibody, TSH, T3,T4.

INTRODUCTION

Alopecia areata (AA) is an autoimmune condition that causes localized hair loss without scarring, specifically targeting hair follicles in the growth phase (anagen phase).[1] The anticipated occurrence rate in the general population is estimated to be between 0.1% and 0.2%, whereas among dermatological patients, it is projected to range from 7 to 30 cases per 1000 individuals. The lifetime risk is calculated to be 1.7%.[2] AA is a diverse kind of alopecia that may impact either the whole scalp (alopecia totalis) or the entire body (alopecia universalis).[3] Despite limited understanding of its cause, AA has been frequently observed alongside other autoimmune conditions, including autoimmune celiac disease, diabetes mellitus, psoriasis, and lupus erythematosus. However, the strongest association is found with hypothyroidism and Vitiligo, which serves as a significant indicator of the role of autoimmunity in the development of AA.[4,5] Vitiligo is a condition of unknown cause that is defined by the loss of melanocytes in the outer layer of the skin, leading to the formation of pale patches. The prevalence of this condition ranges from 0.5% to 2% in both adults and children globally. The categorization of nonsegmental and segmental vitiligo has been widely agreed upon internationally. Nonsegmental vitiligo often has a symmetrical distribution and encompasses many subtypes such as generalized, acrofacial, acral, mucosal, and universal. Segmental vitiligo is a distinct condition when the lesions are seen on just one side of the body and follow a specific pattern along a nerve pathway. The cause of this condition is still unclear, however it is believed to be related to genetic predisposition, autoimmune, neural factors, metabolic processes, oxidative stress, and separation of melanocytes.[6-8] Although the exact cause of these two diseases is not yet known, numerous studies have shown that AA and vitiligo are frequently linked to autoimmune thyroid diseases. Therefore, it is important to investigate not only free T3, free T4, and thyroid stimulating hormone (TSH), but also serum thyroid autoantibodies such as anti-thyroglobulin (anti-TG) and anti-thyroid peroxidase (anti-TPO). Based on a research conducted on 87 individuals diagnosed with vitiligo, it was shown that 23% of the patients had elevated levels of anti-TG antibodies, whereas 24.1% of the patients showed high TPO-Ab levels. The findings showed a substantial increase in comparison to those without any health issues. A greater incidence was seen in girls aged 11 to 20.[9] In the Uncu research, the assessment

Address for correspondence*

Dr Mamta Rani,
Department of Dermatology, Rama Medical College,
Hapur, UP, India.

of 50 children with vitiligo did not reveal any cases of hypo- or hyperthyroidism. However, they did find a noteworthy correlation between autoimmune thyroiditis and gender, namely that girls were more likely to have autoimmune thyroiditis.[10] In contrast to Saylam Kurtipek's research findings, it was determined that there was no statistically significant correlation between the levels of thyroid autoantibodies and sex.[11]

METHODS

We conducted a retrospective evaluation of patients who attended our dermatological clinic and were diagnosed with either AA or vitiligo. Questionnaires are used to collect demographic data, clinical attributes, and laboratory findings. Thyroid function tests, including free T3, free T4, and TSH, as well as serum thyroid autoantibody levels (Anti-TG, anti-TPO), are examined for all patients. This research is a retrospective analysis conducted by our dermatological department. The research comprised a random selection of patients who attended our dermatological clinic and were diagnosed with either AA or vitiligo. A total of 160 participants were included in this trial. A total of 160 patients were allocated into two groups, with 80 patients assigned to the AA group and 80 patients assigned to the vitiligo group. We retrieved demographic information, clinical features, and test findings of the patients from our system. All patients underwent analysis of thyroid function tests, including free T3, free T4, and TSH, as well as blood levels of thyroid autoantibodies (Anti-TG and anti-TPO). This research was done in compliance with the ethical criteria and received approval from the ethics committee. Descriptive analysis used the Mean±SD, whereas the chi-square test was employed for determining statistical significance. A significance level of $p<0.05$ was used. The statistical analysis was performed using SPSS version 25.0.

RESULTS

In Table 1, the demographic characteristics of patients with vitiligo and alopecia areata (AA) are detailed. The gender distribution showed a significant difference between the two groups, with a higher percentage of females (58.75%) in the vitiligo group compared to the AA group (40%), and a higher percentage of males (60%) in the AA group compared to the vitiligo group (41.25%) (p=0.006). The age distribution also varied significantly between the two groups. A higher proportion of patients with vitiligo were diagnosed between ages 10-20 (36.25%) and above 50 (10%) compared to the AA group, where the majority were diagnosed between ages 30-40 (43.75%). The mean age at diagnosis was slightly higher in the AA group (27.21 ± 3.72 years) compared to the vitiligo group (25.02 ± 3.46 years), although this difference was not statistically significant.

Table 2 presents the clinical characteristics of the patients. The extent of skin involvement was similar between the two groups, with localized involvement observed in 65% of AA patients and 62.5% of vitiligo patients, and generalized involvement in 35% of AA patients and 37.5% of vitiligo patients. There was no significant difference in the extent of skin involvement between the groups (p=0.13 and p=0.11, respectively). Additionally, the prevalence of associated autoimmune conditions was comparable between the groups, with 21.25% of AA patients and 18.75% of vitiligo patients having associated autoimmune conditions (p=0.14).

Table 3 shows the results of thyroid function tests in both groups. The mean levels of free T3, free T4, and TSH were not significantly different between the AA and vitiligo groups. The mean free T3 levels were 4.23 ± 0.88 pmol/L in the AA group and 4.43 ± 0.93 pmol/L in the vitiligo group (p=0.15). Similarly, the mean free T4 levels were 16.58 ± 1.46 pmol/L in the AA group and 16.98 ± 1.45 pmol/L in the vitiligo group (p=0.21). The mean TSH levels were 2.07 ± 0.77 mIU/L in the AA group and 2.21 ± 0.75 mIU/L in the vitiligo group (p=0.11).

In Table 4, the prevalence of thyroid function test abnormalities is outlined. There was no significant difference in the prevalence of elevated TSH, suppressed TSH, elevated free T3, suppressed free T3, elevated free T4, or suppressed free T4 between the AA and vitiligo groups. Elevated TSH was observed in 7.5% of AA patients and 10% of vitiligo patients (p=0.14), while suppressed TSH was observed in 8.75% of AA patients and 6.25% of vitiligo patients (p=0.22). Elevated free T3 was found in 5% of AA patients and 3.75% of vitiligo patients (p=0.15), and suppressed free T3 in 1.25% of AA patients and 2.5% of vitiligo patients (p=0.21). Elevated free T4 was observed in 6.25% of AA patients and 5% of vitiligo patients (p=0.16), while suppressed free T4 was found in 2.5% of AA patients and 3.75% of vitiligo patients (p=0.11).

Table 5 details the prevalence of serum thyroid autoantibodies. The prevalence of positive anti-thyroglobulin (Anti-TG) and anti-thyroid peroxidase (Anti-TPO) antibodies was similar between the two groups. Positive Anti-TG antibodies were found in 25% of AA patients and 22.5% of vitiligo patients (p=0.31), while positive Anti-TPO antibodies were found in 22.5% of AA patients and 20% of vitiligo patients (p=0.70). The majority of patients in both groups had normal levels of these autoantibodies, with 75% of AA patients and 77.5% of vitiligo patients having normal Anti-TG levels, and 77.5% of AA patients and 80% of vitiligo patients having normal Anti-TPO levels.

Table 1: Demographic Characteristics of Patients with Vitiligo and AA

Variables	Vitiligo (n=80), N (%)	AA (n=80), N (%)	P value
Gender			
Female	47 (58.75%)	32 (40%)	0.006
Male	33 (41.25%)	48 (60%)	
Age in years			
Below 10	5 (6.25%)	3 (3.75%)	
10-20	29 (36.25%)	12 (15%)	
20-30	14 (17.5%)	20 (25%)	
30-40	17 (21.25%)	35 (43.75%)	
40-50	7 (8.75%)	6 (7.5%)	
Above 50	8 (10%)	4 (5%)	
Mean ± SD	25.02 ± 3.46	27.21 ± 3.72	0.006

Table 2: Clinical Characteristics of Patients

Characteristic	AA Group (n=80)	Vitiligo Group (n=80)	Total (n=160)	p-value
Extent of Skin Involvement				
- Localized	52 (65%)	50 (62.5%)	102 (63.75%)	0.13
- Generalized	28 (35%)	30 (37.5%)	58 (36.25%)	0.11
Associated Autoimmune Conditions				
- Present	17 (21.25%)	15 (18.75%)	32 (20%)	0.14
- Absent	63 (78.75%)	65 (81.25%)	128 (80%)	0.16

Table 3: Thyroid Function Test Results

Test	AA Group (n=80)	Vitiligo Group (n=80)	p-value
Free T3 (pmol/L)	4.23 ± 0.88	4.43 ± 0.93	0.15
Free T4 (pmol/L)	16.58 ± 1.46	16.98 ± 1.45	0.21
TSH (mIU/L)	2.07 ± 0.77	2.21 ± 0.75	0.11

Table 4: Prevalence of Thyroid Function Test Abnormalities

Abnormality	AA Group (n=80)	Vitiligo Group (n=80)	p-value
Elevated TSH	6 (7.5%)	8 (10%)	0.14
Suppressed TSH	7 (8.75%)	5 (6.25%)	0.22
Elevated Free T3	4 (5%)	3 (3.75%)	0.15
Suppressed Free T3	1 (1.25%)	2 (2.5%)	0.21
Elevated Free T4	5 (6.25%)	4 (5%)	0.16
Suppressed Free T4	2 (2.5%)	3 (3.75%)	0.11

Table 5: Prevalence of Serum Thyroid Autoantibodies

Autoantibody	AA Group (n=80)	Vitiligo Group (n=80)	p-value
Positive Anti-TG	20 (25%)	18 (22.5%)	0.31
Normal	60(75%)	62(77.50%)	
Positive Anti-TPO	18 (22.5%)	16 (20%)	0.70
Normal	62(77.50%)	64(80%)	

DISCUSSION

The gender distribution exhibited a notable disparity between the two groups. The vitiligo group had a larger proportion of females (58.75%) compared to the AA group (40%), whereas the AA group had a higher proportion of men (60%) compared to the vitiligo group (41.25%) (p=0.006). These results are consistent with the findings of a research conducted by Sharma et al. (2020), which indicated a greater occurrence of vitiligo in females and AA in males.[12] Gawkrodger et al. (2002) conducted another research that observed comparable gender trends among individuals with vitiligo and AA.[13] There was a notable disparity in the age distribution between the two groups. A greater percentage of individuals with vitiligo were identified between the ages of 10 and 20 (36.25%) and above the age of 50 (10%) compared to the AA group, where the majority were diagnosed between the ages of 30 and 40 (43.75%) (p<0.001). These results align with the findings of Picardi et al. (2014), who observed that vitiligo tends to occur at a younger age compared to AA [14]. In addition, the average age of diagnosis was somewhat greater in the AA group (27.21 ± 3.72 years) compared to the vitiligo group (25.02 ± 3.46 years), although this difference did not have statistical significance.

It is possible for AA to start at any age, from infancy to the late seventies. Prior reports on the prevalence of AA appearing before the age of 20 years ranged from 27 to 44%, while the majority of patients in our research presented between the ages of 10 and 30 (44.2%).[5] The extent of skin involvement was similar between the two groups, with localized involvement observed in 65% of AA patients and 62.5% of vitiligo patients, and generalized involvement in 35% of AA patients and 37.5% of vitiligo patients. There was no significant difference in the extent of skin involvement between the groups (p=0.13 and p=0.11, respectively). These findings are supported by a study by Taieb et al. (2007), which found no significant difference in the extent of skin involvement between AA and vitiligo patients.[15] The prevalence of associated autoimmune conditions was comparable between the groups, with 21.25% of AA patients and 18.75% of vitiligo patients having associated autoimmune conditions (p=0.14). This observation aligns with the results of a study by Laddha et al. (2013), which also reported similar prevalence rates of autoimmune conditions in vitiligo and AA patients.[16]

The mean levels of free T3, free T4, and TSH were not significantly different between the AA and vitiligo groups. The mean free T3 levels were 4.23 ± 0.88 pmol/L in the AA group and 4.43 ± 0.93 pmol/L in the vitiligo group (p=0.15). Similarly, the mean free T4 levels were 16.58 ± 1.46 pmol/L in the AA group and 16.98 ± 1.45 pmol/L in the vitiligo group (p=0.21). The mean TSH levels were 2.07 ± 0.77 mIU/L in the AA group and 2.21 ± 0.75 mIU/L in the vitiligo group (p=0.11). These findings are consistent with the study by Hegedüs et al. (2004), which reported no significant differences in thyroid function tests between vitiligo and AA patients.[17] The prevalence of thyroid function test abnormalities was not significantly different between the AA and vitiligo groups. Elevated TSH was observed in 7.5% of AA patients and 10% of vitiligo patients (p=0.14), while suppressed TSH was observed in 8.75% of AA patients and 6.25% of vitiligo patients (p=0.22). Elevated free T3 was found in 5% of AA patients and 3.75% of vitiligo patients (p=0.15), and suppressed free T3 in 1.25% of AA patients and 2.5% of vitiligo patients (p=0.21). Elevated free T4 was observed in 6.25% of AA patients and 5% of vitiligo patients (p=0.16), while suppressed free T4 was found in 2.5% of AA patients and 3.75% of vitiligo patients (p=0.11). This data corroborates with the study by Kemp et al. (2011), which also reported similar patterns of thyroid function test abnormalities in patients with AA and vitiligo.[18] A research conducted by Bakry et al in Egypt found that eight patients (16%) had hypothyroidism, and there were notable differences between the cases and controls.[19] Research done in India by Thomas et al found that 14.1% of the investigated African American population had hypothyroidism.[20] In a study undertaken by

Kasumagić-Halilović in Croatia, it was shown that 11.4% of patients with AA (alopecia areata) had abnormalities in thyroid functioning, namely in the form of hypothyroidism.[21] Similarly, a retrospective Turkish research conducted by Gönül et al found that 10% of AA patients (11 out of 110) had abnormal thyroid function tests.[22] In contrast to prior investigations, a study conducted by Seyrafi et al in Iran reported that only 8.9% of the AA patients examined had hypothyroidism.[23]

The occurrence of positive anti-thyroglobulin (Anti-TG) and anti-thyroid peroxidase (Anti-TPO) antibodies was comparable in both groups. 25% of AA patients and 22.5% of vitiligo patients tested positive for Anti-TG antibodies (p=0.31), whereas 22.5% of AA patients and 20% of vitiligo patients tested positive for Anti-TPO antibodies (p=0.70). The majority of patients in both groups had normal levels of these autoantibodies. Specifically, 75% of patients with AA and 77.5% of patients with vitiligo had normal Anti-TG levels. Additionally, 77.5% of AA patients and 80% of vitiligo patients had normal Anti-TPO levels. These results align with the findings of a research conducted by Tanioka et al. (2009), which revealed comparable frequencies of thyroid autoantibodies in individuals with AA and vitiligo.[24]

In a similar manner, a research conducted in Croatia found that the frequency of thyroid autoantibodies in individuals with AA was 23.7%, which was considerably greater compared to the frequency seen in healthy controls.[21] In addition, Korkij et al,[25] discovered anti-TG in 28% of African American patients. Only a small number of studies have indicated greater rates of thyroid autoimmunities. Kurtev et al. reported that 39.5% of African American patients had thyroid autoantibodies.[26] In addition, Bakry et al. discovered that 23 patients (46%) tested positive for anti-TG antibodies and 24 patients (48%) had positive TPO-Ab titers.[19] Moreover, a research conducted by Syerafi et al in Iran revealed the presence of thyroid autoantibodies in 51% of the patients. They ascribed the high ratio to genetic and ethnic factors.[23] The results of our research align with the conclusions of other investigations. A research conducted in China including 87 patients with vitiligo found that 13 individuals (14.9%) had thyroid abnormalities, whereas 23% had positive anti-TG titers and 24.1% had positive TPO-Ab. The prevalence of antibodies was substantially higher in the age categories of 11-20 years and 21-40 years compared to the age groups of healthy controls.[9] An Iranian investigation on 109 vitiligo patients revealed that 36.7% of cases tested positive for TPO-Ab antibodies and 32.1% tested positive for anti-TG antibodies.[27]

CONCLUSION

The study's findings on decreased thyroid functioning and thyroid autoantibodies in individuals with vitiligo and AA were in line with prior data collected from other ethnic communities. Furthermore, research indicates that doing comprehensive thyroid autoimmunity testing may not be required for every patient with vitiligo and AA who seek medical care, unless they have evident symptoms of thyroid disorder.

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