

Original Research Article

Evaluation of thyroid function status in patients with alopecia areata

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ABSTRACT

Background: Epidemiologic reports suggest a high prevalence of thyroid function abnormalities among patients with alopecia areata. Hence, this study was designed to investigate this hypothesis among indigenous Nigeria patients with alopecia areata.

Methods: The study was a retrospective analysis of records of thyroid function investigations of patients with alopecia areata who had presented to the Department of Chemical Pathology and Metabolic Medicine of the University of Port Harcourt Teaching Hospital (UPTH), Nigeria over a 10-year period (1st January 2007 and 31st December 2016). Records of patients' age, sex, thyroid stimulating hormone (TSH), total thyroxine (T4), and total triiodothyronine (T3) were acquired from laboratory records and analyzed using SPSS version 15. A $p < 0.05$ was applied as being significant.

Results: One hundred and thirteen (113) records of patients with alopecia areata were reviewed, among them 55 (48.7%) males and 58 (51.3%) females with no sex difference ($p = 0.778$). The mean age of study cohorts was 29.42 ± 10.27 (range 16–63) with the majority (61.9%) between the age group 20 to 40 years. No difference in the mean age, TSH, and T3 levels were observed between the males and females. Thyroid function abnormalities were observed in 27.3% of study cohorts and the most prevalent abnormality was hypothyroidism (16.8% subclinical and 4.4% primary) with a female preponderance.

Conclusions: The study suggests an association of alopecia areata with thyroid function abnormalities. Patients with alopecia areata should be screened for thyroid function abnormalities irrespective of clinical status.

Keywords: Alopecia areata, Thyroid functional abnormalities, Hypothyroidism

INTRODUCTION

Alopecia areata (AA) is a heterogeneous variant of alopecia characterized by patchy and scarless loss of hair secondary to the destruction of anagen phase hair follicles in different regions of the body and could involve the nails.^{1,2} It commonly presents in the scalp region with no race, sex or age predilection.³ However, several authors had documented that the condition presents mainly among the younger age groups with a reported global population prevalence rate of 1%.^{3,4} The true incidence

and prevalence rates of alopecia areata in Africa is poorly-documented and ill-defined, however, in Nigeria, recent reports from the north and south-west part of the country had documented a prevalence rate between 1–1.2% of the disorder among the population.^{5,6}

Decades-long after AA was first described and documented in the literature, its etiopathogenesis has remained elusive in the medical parlance.^{7,8} However, different postulations and theories have been put forward to elucidate the exact pathway of its evolution. The first theory put forward was the viral, fungal, and bacterial

infection theory, followed by the genetic theory, and finally the environmental theory.^{9,10} These theories had all been adduced as triggers of AA evolution in humans by various authors.¹⁰⁻¹² However, the most accepted and plausible of these theories in AA evolution and etiopathogenesis is based on that of autoimmunity which posits that AA is an autoimmune disease directed against putative autoantigen of anagen phase hair follicles.¹¹

The autoimmunity theory of AA is based on evidence-based findings of infiltrative inflammatory CD4+ and CD8+ T cells in biopsy specimen of affected hair follicles of AA patients, accompanied by hair follicle-specific autoantibodies within these AA lesions and in the peripheral blood of patients with AA, and the response of treatment of AA to immunosuppressive agents.¹¹⁻¹⁵ Most importantly, AA is associated with varied other autoimmune disorders including vitiligo, rheumatoid arthritis, pernicious anemia, and thyroid function abnormalities.^{11,16} Thyroid function abnormalities secondary to autoimmune mechanism are the most prominent of these disorders documented and reported among AA patients in the literature.¹⁷⁻²²

However, these thyroid function abnormalities have mostly been observed in the western population with a paucity of clinical data in Nigeria. Therefore, this study was conducted in essence to investigate the status of thyroid function among indigenous Nigerian patients with AA.

Objectives

- To determine the pattern of thyroid function abnormalities among patients with AA
- To determine the sex distribution of thyroid function abnormalities among patients with AA.
- To compare the results of this study with the literature.

METHODS

This study was carried out in the Department of Chemical Pathology and Metabolic Medicine of the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Nigeria. UPTH is a tertiary health facility in Nigeria which serves as a referral center for all the peripheral primary and secondary health centers in the south-south part of the country. The Department of Chemical Pathology and Metabolic Medicine is responsible for the biochemical analysis of different human samples from the hospital and the surrounding primary and secondary health centers using both automated and non-automated methods.

The study was a retrospective, descriptive, and cross-sectional designed study conducted from 20th October 2017 to 20th February 2018. Ethical approval and informed consent are not required in UPTH due to the retrospective nature of the study. Laboratory records of

thyroid function investigations were acquired as study materials. Data acquired includes sex, age, serum levels of thyroid stimulating hormone (TSH), total thyroxine (T4), and total triiodothyronine (T3) of all patients with AA who presented for routine screening for thyroid function abnormalities in the Department of Chemical Pathology and Metabolic Medicine UPTH over a 10-year period (1st January 2007 to 31st December 2016). All the patients with AA had all been diagnosed by the specialist dermatologist of the hospital.

Inclusion criteria were records of thyroid function investigations of patients with AA who presented for routine screening for thyroid function abnormalities during the study period.

Exclusion criteria were records of thyroid function investigations with established thyroid disorders including those with incomplete data.

Fasted venous samples were used for all the laboratory investigations. The specimens were collected from each patient via phlebotomy and processed accordingly. Serum analysis for TSH, T4, and T3 was carried out by enzyme immunoassay methods with same brands of laboratory reagent panel with each of their three levels of commercial quality control sera sourced from Monobind Incorporated, California, United States of America through their distributors in Nigeria (NUNS Diagnostics, Nigeria). The three levels of the quality control were employed to ensure analytical accuracy and precision.

All records from laboratory result sheets of each patient were acquired and entered into Statistical Package for Social Sciences (SPSS) version 15. Collected records were age, sex, clinical diagnosis (AA), serum TSH in mIU/l (normal range: 0.4–6.8), serum T4 in nmol/l (normal range: 60–155), serum T3 in nmol/l (normal range: 0.9–2.9).

All acquired data entered into SPSS version 15 were coded as appropriate. All non-parametrically distributed data were logarithmically transformed prior to analysis. Continuous data were presented as mean±SD and compared with the two-sample t test. Categorical variables were presented in numbers and percentages and compared using Chi-square test or Fisher's exact test where appropriate. A p-value of <0.05 was considered statistically significant.

Definitions of thyroid functional abnormalities:

1. Normal function: A Normal TSH levels with normal levels of T4 and T3 levels.
2. Primary hypothyroidism: A High TSH levels with low levels of T4 plus or minus low T3 levels.
3. Primary hyperthyroidism: A Low TSH level with high levels of T4 and T3 levels.
4. Subclinical hypothyroidism: A High TSH level with normal levels of T4 and T3 levels.

5. Subclinical hyperthyroidism: A Low TSH level with normal levels of T4 and T3 levels.
6. Secondary hypothyroidism: A low TSH with low T4 and T3 levels.
7. Secondary hyperthyroidism: A high TSH with high T4 and T3s levels.

Data of 113 of these records met the inclusion criteria and were recruited for the study. Eight of these records were excluded because five had incomplete data and three were on treatment for already diagnosed thyroid disorders.

In Table 1, of the 113 records of subjects reviewed in this study, 55 (48.7%) were males while 58 (51.3%) were females with no statistical sex difference (p=0.778). The mean age, TSH, T4, and T3 values were 29.42±10.27 years (range 16–63), 88.56±26.63 nmol/l, 4.07±3.76 nmol/l and 1.73±0.68 nmol/l respectively. However, no statistical difference was observed in the mean age, TSH, T4, and T3 values between the males and females.

RESULTS

During the period spanning from 1st January 2007 to December 2016, 121 patients with AA presented to the Department of Chemical Pathology and Metabolic Medicine (UPTH) for routine screening of thyroid function abnormalities using serum TSH, T4, and T3.

Table 1: Demographic and laboratory characteristics of study cohorts.

Parameter	Overall study cohorts Mean±SD	Male Mean±SD	Female Mean±SD	P value
Sex n (%)	113 (100)	55 (48.7)	58 (51.3)	0.778
Age (years)	29.42±10.27	28.71±10.62	30.10±9.96	0.479
TSH (mIU/l)	4.07±3.76	3.55±3.55	4.56±4.31	0.155
T4 (nmol/l)	88.56±26.63	91.94±29.0	85.36±23.94	0.191
T3 (nmol/l)	1.73±0.69	1.81±29.04	1.66±0.79	0.245

SD= Standard Deviation; TSH= Thyroid Stimulating Hormone; T4= Thyroxin T3= Triiodothyronine; mIU/l= Milli International unit per liter; nmol/l= Nanomole per liter.

Table 2: Distribution of age groups.

Age groups (years)	N	%
<20	24	21.2
20–40	70	61.9
40-60	17	15.0
>60	2	1.9

Chi-square test= 91.212; p value ≤0.001**Statistically significant.

Table 3: Thyroid function status of study cohorts.

Thyroid function status	Sex		Total n (%)
	Male n (%)	Female n (%)	
Normal function	42 (76.4)	40 (69)	82 (72.6)
Abnormal function	13 (23.6)	18 (31)	31 (27.3)

Chi-square test= 83.672; p<0.001**Statistically significant.

Table 4: Distribution of various thyroid function abnormalities among study cohorts.

Status of thyroid function	Overall study cohorts	Male	Female
	n (%)	n (%)	n (%)
Normal function	82 (72.6)	42 (76.4)	40 (69.0)
Primary hypothyroidism	5 (4.4)	1 (1.8)	4 (6.9)
Primary hyperthyroidism	3 (2.7)	1 (1.8)	2 (3.4)
Subclinical hypothyroidism	19 (16.8)	8 (14.5)	11 (19.0)
Subclinical hypothyroidism	4 (3.5)	3 (5.5)	1 (1.7)
Secondary hypothyroidism	0 (0)	0 (0)	0 (0)
Secondary hyperthyroidism	0 (0)	0 (0)	0 (0)

Fisher’s exact test= 3.449; p=0.513.

In Table 2, the majority (61.9%) of the study cohorts were in the age group 20 to 40 years while the least (1.9%) were above 60 years of age.

In Table 3, thyroid function abnormalities were observed in 27.3% of the study cohorts with a female preponderance (18 female versus 13 males).

In Table 4, the most prevalent thyroid function abnormality observed in both sexes is hypothyroidism (16.8% subclinical and 4.4% primary) and the female predominated in both cases of hypothyroidism. Secondary disorders of thyroid function were not observed among the study cohorts.

DISCUSSION

Alopecia areata (AA) is a heterogeneous variant of alopecia characterized by the patchy non-scarring loss of anagen phase hair follicles which sometimes involves the nails in very severe variants.¹ It has an unpredictable clinical course with no sex, age, or racial predilection.^{1,2} In terms of sex characteristics of AA patients, some authors had suggested a more male preponderance while others found no difference.¹¹ In this study, we found no statistical difference in the sex distribution among our study cohorts, however, females were more than the males. The higher female number observed could be related to the increased concern of women for their physical appearance than the men.

The condition can occur at any age but seem to be more prevalent among the younger age groups.²³ The youngest patient reported in the literature was four months old while the oldest was in the late seventies.²⁴ Several authors have documented several peak age of onset of AA. While others have reported less than twenty years of age as the peak, others have reported between twenty and forty years.²⁴ However, the generality of these reports have reported on the age group twenty to forty years as the peak age of onset of AA.²⁵ In this study, the majority (61.9%) of the study cohorts were in the age range twenty to forty years which is in accord with the generality of the reports in the literature.

The etiopathogenesis of alopecia areata has remained an enigma several decades after it was first described in the literature.^{7,8} However, several theories had been adduced to its evolution and etiopathogenesis in humans in recent years among them viral and fungal infections, genetics, environmental, and autoimmunity.¹¹ Among these several theories, the theory of autoimmunity seems the most plausible theory evidenced by the local inflammatory infiltrates of T cells in AA lesions, the specific autoantibodies against anagen phase hair follicles in alopecia areata lesions and in the peripheral blood of patients with AA, the response of alopecia areata to immunosuppressive agents, and the concomitant manifestation of other autoimmune diseases in alopecia areata.¹¹⁻¹⁵

Among the various other disorders secondary to this autoimmune mechanism associated with alopecia areata, thyroid function abnormalities are the most reported among these patients with alopecia areata.¹⁷⁻²⁰ Kasumagic-Halilovic reported a prevalence of 11.4%, Seyrafi et al reported a prevalence of 8.9%, Bakery et al reported a prevalence of 16%, and Puavilai et al reported a prevalence of 7.2% of various degrees of thyroid function abnormalities in various studies.¹⁷⁻²⁰ In this study, the prevalence of thyroid function abnormalities observed among our study cohorts was 27.3%, which is higher than the reports from these previous studies and suggest an increased prevalence of thyroid function abnormalities among our study cohorts.

The most common thyroid function abnormality noted among alopecia areata patients in the literature is hypothyroidism. Bakery et al had reported a high rate of subclinical hypothyroidism as the most common thyroid functional abnormality among Egyptian patients with alopecia areata. In a clinical study conducted among alopecia areata subjects by Thomas and Kadyan, hypothyroidism was reported as the most prevalent of thyroid function abnormalities. While Lyakhovitsky et al also noted a similar pattern of hypothyroidism in their own study.^{21,22} These reports are all in accord with the findings of this study where we noted that majority of the alopecia areata patients presented with hypothyroidism with subclinical hypothyroidism predominating.

CONCLUSION

The finding of this study suggest an association of alopecia areata with thyroid function abnormalities and supports the numerous reports of high prevalence of thyroid disorders in patients with alopecia areata. Therefore, patients who present with alopecia areata should be screened for thyroid function abnormalities irrespective of clinical status.

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