Evaluation of thyroid hormones in Alopecia Areata in Iraqi patients

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Abstract- Alopecia is a general term for hair loss. Alopecia areata is a common cause of non-scarring hair loss that can occur at any age. It usually causes small, coin-sized, round patches of baldness on the scalp, although hair elsewhere such as the beard, eyebrows, eyelashes, body and limbs can be affected. In some people larger areas are affected and occasionally it can involve the whole scalp (alopecia totalis) or even the entire body and scalp (alopecia universalis) .

It is not possible to predict how much hair will be lost. Regrowth of hair in typical alopecia areata is usual over a period of months or sometimes years, but cannot be guaranteed. The chances of the hair regrowing are better if less hair is lost at the beginning.

Most people, with only a few small patches get full regrowth within a year. If more than half the hair is lost then the chances of a full recovery are not good. The hair sometimes regrows white, at least in the first instance. Most people get further attacks of alopecia areata. In alopecia totalis and alopecia universalis, the likelihood of total regrowth is less .

Hair is lost because it is affected by inflammation with main cause of this inflammation is unknown but it is believed that the immune system, may attack growing hair .The disease of alopecia areata is considered more affected by autoimmune diseases such as thyroid disease, although the risk of developing these disorders is still very low

In present study aimed To identify the correlation between thyroid function in alopecia areata patients and compare it with healthy control. And determined the prevalence of alopecia areata according to gender .

A Case control study carried out at the outpatient clinic of dermatology department in Salah Aldeen general hospitals during the period from 1st of October 2018 to 30th of April 2019. We selected 100 patients included 50 patients with alopecia areatia as a cases and compared with 50 normal person. Then thyroid function test of cases was compared with that of equal number of age and sex matched healthy controls.

The result of study revealed a total of 100 patients were enrolled in both case and control groups. Mean age of case and control groups were 24.30+6.80 the most prevalent age group was <18 years 39%.The prevalence of thyroid disorder was significantly higher in alopecia areata group (34%) as compared to the control group (14%) (P=0.001) .

The Conclusion of this study found a significant association between alopecia areata and thyroid dysfunction .

I. Introduction

Alopecia areata (AA) is a chronic autoimmune disease of the Pilar follicles and sometimes affected nails. It characterized by no scarring alopecia and can affect any hair-bearing area of the body. The loss of scalp and body hair by interruption of their synthesis, though without destruction or atrophy of the follicles and consequently can be reversible. The onset may be at any age and there is no unknown race or sex preponderance.[1]

The affected skin that may be slightly reddened but otherwise appears normal. Short broken hairs (exclamation mark hairs) are frequently seen around the margins of expanding patches of alopecia areata.[2]

The most common pattern is a small annular or patchy bald lesion (patchy alopecia areata), usually on the scalp, that can progress to total loss of scalp hair only (alopecia totalis), and total loss of all body hair (alopecia universalis).[3]

This skin disease can begin at any time of life and the peak of incidence between 20 and 50 years of age, and other articles affirm 60% of the patients present the first episode of the disease before 20 years of age.2 and according

to several study founded more than 70% of the cases occurred between 10 and 25 years., although it has been observed that with relation to the severe forms, 63% occur in men and 36% in women.[4]

Alopecia areata accounts for 2% of the first dermatological consultations in the United Kingdom and United States. as documented by several large epidemiological studies from Europe, North America, and Asia, the prevalence of alopecia areata in the early 1970s was reported to be between 0.1% to 0.2% with a life time incidence of 1.7%.5,3. A follow-up study of this population form 1990–2009 found that the cumulative incidence increased almost linearly with age and that the lifetime incidence of alopecia areata was 2.1% .[6]

Some studies show that the prevalence seems to shift to women in patients >45 years of age1. And another no sexual dichotomy. Most studies report no significant differences in the age of onset, duration, or type of alopecia areata by sex or ethnicity.[7]

The aim of study **:**

Identify the correlation between thyroid function test and alopecia areata and compare it with healthy control.

Objective

1.Evaluate the serum thyroid hormones (throxine) (T4), triiodothyronoine (T3) and thyroid stimulating hormone (TSH) level in both study groups (alopecia areata) and control group.

2.Identify the prevalence of alopecia areata according to gender.

II. PATIENTS AND METHODS

Ethical consideration

• Agreement of MOH-Iraq, and Salah Alden directorate of health.

The collection of data was kept confidential and not be divulged except for the purpose of the study.

The Participant's agreement will be considered and they will be informed that the participation is voluntary and they can withdraw from the study after having agreed to participate

A written informed consent from each participant was obtained after explaining the study objectives and prior to the start of data collection.

Study Design, Study setting and Study population

Hospital based case control study was conducted in Salah Alden general hospitals during the period from 1st of October 2018 to 30th of April 2019.The researcher visited the hospitals 5 times a week from 8:30 a.m. to 1:30 p.m. for four months .Target population in this study was the people who lived in Salah Alden governorate with different aged.

: *Data collection tools*

The data were collected by the researcher using the following tools :

Questionnaire

The questionnaire was prepared by the researcher. The data requested included: age, sex, and level of education, residency, occupational history, and family history of disease, history of systemic diseases (hypertension, DM, coronary artery disease (CAD), and AF, duration of disease and history of thyroid disorders.

About the past medical history regarding the systematic disease, the patient was regarded as positive history if the condition had been previously diagnosed by specialist physician, or if he was receiving medicine specified to the disease.

Physical examination

Physical examination was performed by the researcher for each patient .

Inclusion criteria

Cases:

Patients with (a alopecia areata) diagnosed by the consultant dermatology or dermatologists in dermatology department of Salah Alden general hospital.

Controls

Patients attending to the same hospital of the cases and without previous history of alopecia areata. Those participants matches the alopecia's cases in gender and age (± 5 years)

Exclusion criteria

Cases

a) Patients not residing in Salah Alden governorate .

b) Secondary type's alopecia areata

c) Patients with any chronic diseases (like asthma, diabetes mellitus) or on chronic medication (like cortisone)

d) Any Psychotic patients

.Those patients of chronic and critical disease were not include by the researcher for two reasons, ethically and scientifically. Ethically because those patients are tired and psychologically disturbed .

Laboratory investigations

A- Thyroid function test

This is done by measuring thyroid hormones level in blood that included

thyroxine (T4)

triiodothyronine (T3)

thyroid stimulating hormone (TSH) level

Collection of Blood Sampling

The patients in the word should be overnight fasting 12 hours then a sample of venous blood was drawn from the anticubital vein using disposable syringes by expert paramedical staff and taken 5 ml of blood from patients .

The blood samples were coded and sent to the lab of the hospital for testing the samples, then the results registered on the laboratory form to the patients' case sheet.

Methods

.Kit name was (ichromax)

Principal and procedure: after taken blood sample from patient, we separation blood serum by centrifuge and taken 0.75 ml by specific tube (small green tube) and added it to specific material in yellow tube after that mixed the material with serum and shaking it for 10 time, and put 0.75 ml from mixture on white slide, enter the slide to advice for 8 min for T3 and T4 but TSH 12 min. at temperature 20c. We calculated that by specific device and record the reading.

Statistical Analysis

The data were reviewed, cleaned with double check entry into the computer using Statistical Package for Social Sciences (SPSS) version 20; then, it was coded by the researcher under supervision of the academic supervisor and statistician .

- The data presented as frequency and percentages tables, pie and bar charts were used also.
- A chi – square test was performed to assess relations between categorical variables.
- T-test was used for testing significance of difference between different numerical variables.
- A level of p – value equal to or less than 0.05 was considered significant, while odds ratio (OR) with its 95% confidence interval (CI) was calculated.then had their blood tested for S. cholesterol , S.TG, and other lipid profiles tests and A1c. After completion of all anthropometric measures and blood tests. Subjects completed the demographic questionnaire.

III. RESULTS

The current study included 100 patients, 50 of them were suffering from alopecia areata to be compared with 50 normal individual. Out of total sample 55% were females and 45% were male.)Figure 1 (

The age of study sample included three category, the most prevalent age group was <18 years 39% and 34% at age 18-35 years, while the least was more than 35 years (27%) (figure 2).

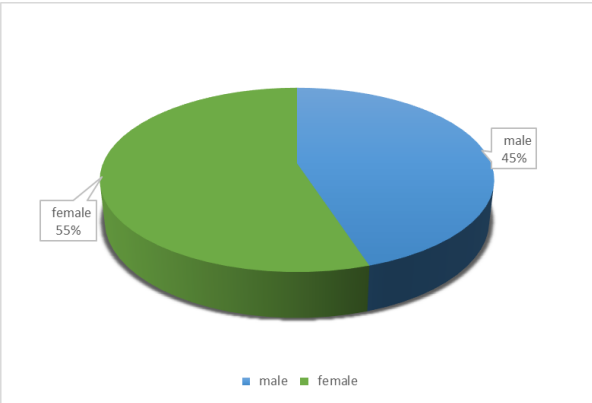

Figure 1: Distribution of study sample according to gender. N=100

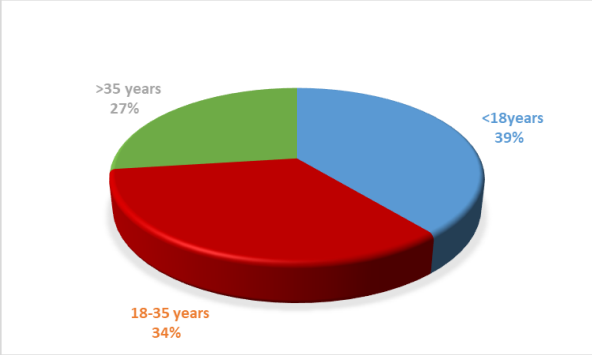

Table 1: Distribution of study sample according to sociodemographic characteristic

		group		Total
		case	control	
Age	<18years	17	22	39
	18-35 years	18	16	34
	>35 years	15	12	27
Total		50	50	100
Pearson Chi-Square	**8.460a df=2**	**p=0.634**		
		group		Total
		case	control	
Sex	male	24	21	45
	female	26	29	55
Total		50	50	100
Pearson Chi-Square	**0.364 df=1**	**p=0.546**		
		group		Total
		case	control	
education	educated	18	13	31
	Non-educated	32	37	69
Total		50	50	100
Pearson Chi-Square	**1.169 df=1**	**p=0.280**		
		group		Total
		case	control	
occupation	yes	31	23	54
	no	19	27	46
Total		50	50	100
Pearson Chi-Square	**2.576 df=1**	**p=0.108**		

Figure 2: Distribution of study sample according to age. N=100

The current study also showed a difference in family history among cases groups; as the positive family history of cases' was 28% and 72% negative family history. While the duration of disease among patients of alopecia were 62% for less than one years and 38% with history of duration to more than years.

Regarding to severity of disease the study showed 68% have sever disease and 32% have mild to moderate disease. But the types of alopecia was most prevalent multilocularis (46%).as shown in table 2

Table 2: Distribution of study sample according characteristic of disease.

		Frequency
Family history	+ve	14 (28%)
	-ve	36 (72%)
	Total	50
		Frequency
duration		
	<1year	31 (62%)
	>1years	19 (38%)
	Total	50
		Frequency
severity		
	Mild –moderate	16 (32%)
	Sever	34 (68%)
	Total	50
		Frequency
Types		
	unilocularis	11 (22%)
	multilocularis	23 (46%)
	Totalis	10 (20%)
	Universalis	6 (12%)
	Total	50

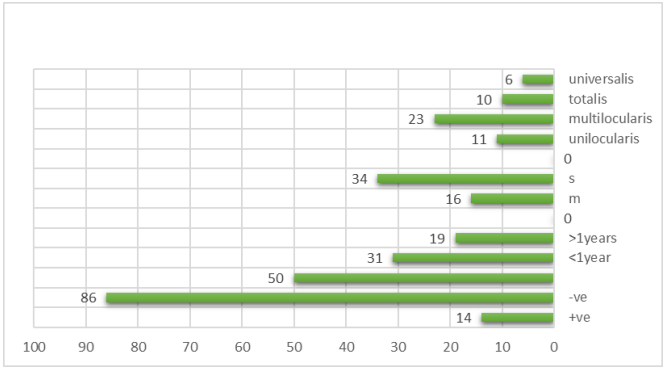

Figure 3: Distribution of study sample according characteristic of disease.

In a comparison of thyroid function test (TSH.T4.T3)between the study groups; the result of study showed increase abnormal level of TSH more in case group than among control group without significantly associated with alopecia areata (p<0.211) and OR= 0.506(0.157-1.63) , while abnormal T3 level was found in the case group more than those who did not have alopecia areata so the chance of alopecia areata is among the case groups more than control group with a statically significant association (p=0.001) and OR=0.316 (0.851-0.117)

Regarding to abnormal T4 level was found in the case group more than those who did not have alopecia (normal group)but without any a statistically significantly associated (p=0.211)and OR=0.352 (0.114-1.088).

Table 3: Relation between thyroid function test and groups (case and control)

		group		Total
		case	control	
TSH	normal	41	45	86
	abnormal	9	5	14
Total		50	50	100
Fisher's Exact Test =1.202 df= 1 p value = 0.211 OR= 0.506(0.157-1.63)				
		group		Total
		case	control	
T3	normal	33	43	76
	abnormal	17	7	24
Total		50	50	100
Pearson Chi-Square 10.363 df= 1 p=0.001 OR=0.316 (0.117-0.851)				
		group		Total
		case	control	
T4	normal	38	45	83
	abnormal	12	5	17
Total		50	50	100
Fisher's Exact Test =1.202 df= 1 p value = 0.211 OR=0.352 (0.114-1.088)				

Table 4: Relation between TSH and characteristic of disease. N=50

		TSH		Total
		normal	abnormal	
Types	unilocularis	11	0	11
	multilocularis	16	7	23
	totalis	10	0	10
	universalis	4	2	6
Total		41	9	50
Pearson Chi-Square 7.975 df=3 p=0.047				
		TSH		Total
		normal	abnormal	
severity	m	11	5	16
	s	30	4	34
Total		41	9	50
Pearson Chi-Square 2.799 df=1 p=0.094				
		TSH		Total
		normal	abnormal	
duration	<1year	25	6	31
	>1years	16	3	19
Total		41	9	50
Fisher's Exact Test 0.101a df=1 p=0.750				

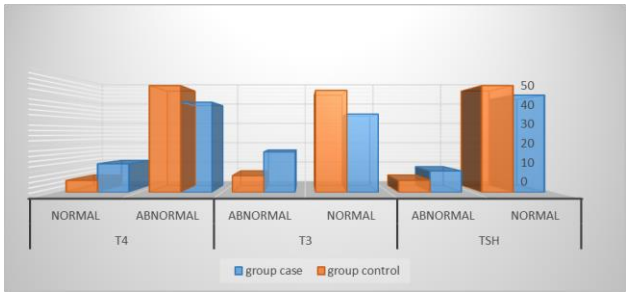

Figure 4: Relation between thyroid function test and groups (case and control).

Regarding to relation of TSH with classification of alopecia, the result of study found significant association between abnormal result of TSH with specific types of alopecia (p= 0.047).While the relation to relation of TSH with severity of alopecia, the result of study showed no any significant association between abnormal result of TSH and severity of alopecia (p= 0.094).

Also the relation of TSH with duration of alopecia, the result of study found no any statically difference between abnormal result of TSH with duration of alopecia (p= 0.750).

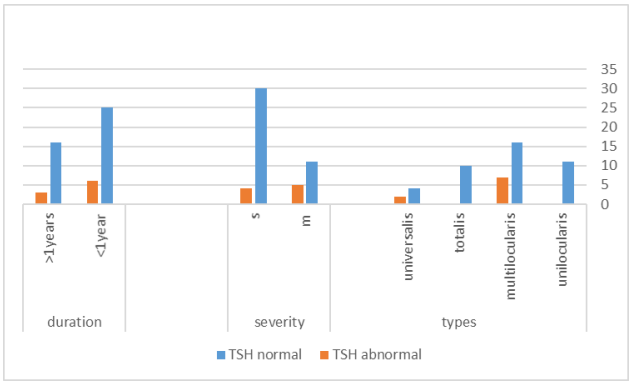

Figure 5: Relation between TSH and characteristic of disease .

Regarding to relation of T3 with classification of alopecia, the result of study found no any significant association between abnormal result of T3 with specific types of alopecia (p= 0.101).
While the relation to relation of T3 with severity of alopecia, the result of study showed a significant association between abnormal result of T3 and severity of alopecia (p= 0.004).

Also the relation of T3 with duration of alopecia, the result of study found a statically difference between abnormal result of T3 with duration of alopecia, more than one years in duration (p= 0.029)

Table 5: Relation between T3 and characteristic of disease. N=50

		T3		Total
		normal	abnormal	
types	unilocularis	10	1	11
	multilocularis	14	9	23
	totalis	7	3	10
	universalis	2	4	6
Total		33	17	50
Pearson Chi-Square	**6.236a df=3**	**p=0.101**		
		T3		Total
		normal	abnormal	
severity	m	6	10	16
	s	27	7	34
Total		33	17	50
Pearson Chi-Square	**8.517a df=1**	**p=0.004**		
		T3		Total
		normal	abnormal	
duration	<1year	24	7	31
	>1years	9	10	19
Total		33	17	50
Pearson Chi-Square	**4.741**	**df=1**	**p=0.029**	

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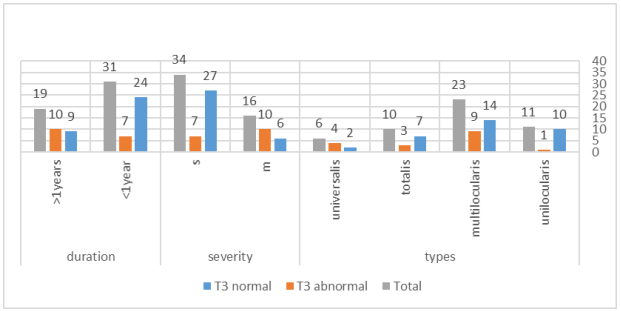

Figure 6: Relation between T3 and characteristic of disease.

Regarding to relation of T4 with classification of alopecia, the result of study found no any significant association between abnormal result of T4 with specific types of alopecia (p= 0.099).
While the relation to relation of T4 with severity of alopecia, the result of study showed no any significant association between abnormal result of T4 and severity of alopecia (p= 0.192).
Also the relation of T4 with duration of alopecia, the result of study found no any statically difference between abnormal result of T4 with duration of alopecia, (p= 0.081).
study also found a significantly higher HbA1c level among acanthosis nigricans patients in comparison to controls (p<0.001),. This finding is similar to results of Rafalson et al [1] study in USA which stated that acanthosis nigricans is accompanied by 50-100% risk of developing diabetes mellitus and poor glycemic control. Studying demographic characteristics of AN patients in present study showed that mean age of AN patients was 39.4 years. This finding is similar to results of Sharquie et al [8] study in Iraq which found that mean age of AN patients in Baghdad was 39 years.

Table 6: Relation between T4 and characteristic of disease. N=50

		T4		Total
		abnormal	normal	
types	unilocularis	6	5	11
	multilocularis	18	5	23
	totalis	10	0	10
	universalis	4	2	6
Total		38	12	50
Pearson Chi-Square 6.285 df=1 p=0.099				
		T4		Total
		abnormal	Normal	
severity	m	14	2	16
	s	24	10	34
Total		38	12	50
Pearson Chi-Square 1.740 df=1 p=0.192				
		T4		Total
		abnormal	normal	
duration	<1year	21	10	31
	>1years	17	2	19
Total		38	12	50
Pearson Chi-Square 3.051 df=1 p=0.081				

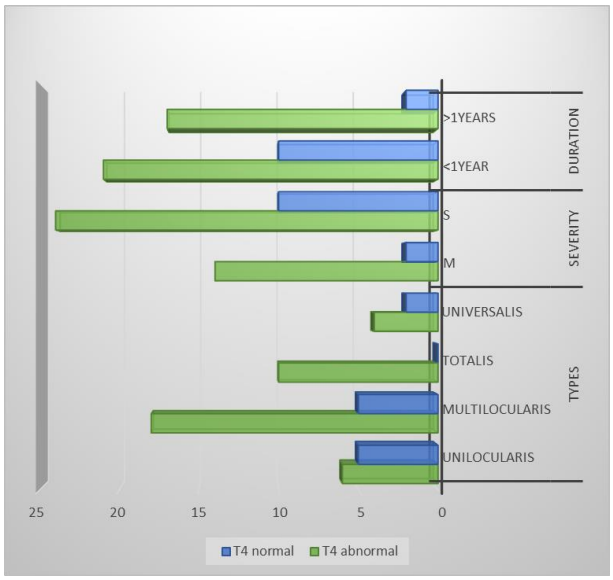

Figure 7: Relation between T4 and characteristic of disease.

IV. DISCUSION

Alopecia areata is a disfiguring health problem. Most studies conducted in this area were to determine the prevalence of AA and they used the cross sectional design.

The aim of the present study was to identify the effect of thyroid dysfunction on alopecia areata by the case control design was used. The risk factors and causes of alopecia areata was very complex and include factors related to individual autoimmunity, families and society and it depends on cultural patterns in each society .

However, the present study has described the different patterns of alopecia seen among cases of alopecia patients and their relation to thyroid dysfunction, age, sex, and associated conditions. And comparison with a normal population.

Gender factor

In current study gender variable was female more than male, as they consist 55% and 45% respectively from the total sample. Female had higher prevalence of alopecia areata than male as 52% and 48% of total cases (50 patients), but this different it not a

statistically significant level. This result similar to study conducted for 158 adult Chinese patients diagnosed as AA in clinic of dermatology of Jinshan Hospital (2017).

But this result disagree with another study conducted in Nepal (2018).86 Male and female in the AA group were 40 (53.3%) and 35 (46.7%) with male: female ratio being 1.14:1. Similarly, male and female in the control group were 39 (49.4%) and 36 (50.7%) with male and female ratio of 1.08 (P=0.870) .

These variations might be attributed to the difference in settings of these studies , study design as a cross – sectional study. 85

Thyroid function test

The current study shown the prevalence of abnormal thyroid function was double in AA group compared to the control group. This result Similar to study conducted in Nepal (2018)86 and another study from India87 also observed that the thyroid disorder was the systemic disease with highest frequency in AA patients. Likewise, a recent Australian study also reported that almost one fourth (24%) of AA patients had thyroid abnormalities.88 Thyroid dysfunction was also found in AA patients in a study done in Pakistan but its prevalence was half (8.9%) as compared to our study.89

It has been observed that thyroid disease is the most common chronic disease in AA patients, including hypothyroidism, thyroiditis, Hashimoto's disease, Graves' disease, and simple thyroid gland.90

Previous studies have shown that the incidence of thyroid disease ranged from 8% to 28% in AA patients. In China91, thyroid disease occurs in AA patients were rarely reported and the only available data was based on non-controlled studies.

In the current study concentrations of T3, T4 and TSH were detected to evaluate thyroid function for AA patients and normal controls.

We did not find statistically significant differences in concentrations of T4 and TSH between AA patients and natural controls, suggesting no obvious damage. However, there were differences with statistical evidence in T3 concentration indicating a relationship between thyroid function in AA patients (p=0.034) and OR=0.316 (0.851-0.117)

Some researchers found many skin disorders such as AA can see in patients with autoimmune thyroid disease, Independently of thyroid function. Most of the time, there is no relationship between cause and effect, but the link may be part of the same weakness of immunity.92

Duration of disease

In present study, duration of disease (alopecia areata) among selected cases only was 62% less than one years while 38% more than one years. This result similar to study conducted in Korea (2017).56 it was retrospective study for 1137 cases of alopecia areata . That found 68% of cases have duration of disease less than one years while 32% more than one years .

Also another study conducted in Department of Dermatology, Jinshan Hospital of Fudan University in china that found 77% of cases have duration of disease less than one years while 23% more than one years.

In current study showed no any correlation between (TSH level, T4 level) and duration of disease (p=0.750,p=0.081 respectively) Regarding to relation between T3 level and duration of disease the result of study show the level of T3 more abnormal with increase duration of disease more than one year. With significant association (p=0.024) with OR =3.5. However the duration of disease as a risk factors by increase the level of T3 three times more than normal. This result similar to case control study conducted in china 85. (2017)

Severity of disease

In present study we found more than 68% of total cases have sever types of disease and 32% have moderate disease.

In current study showed no any correlation between (abnormal TSH level) and severity of disease (p=0.094) also the relation of abnormal T4 level) and severity of disease was not significant (p=0.192) in spite of the level of T4 was more in sever disease cases 48% than those have mild to moderate disease was 28%.

But the relation of T3 level with severity of disease was more level of abnormal T3 among moderate disease with significant association p=0.004 (OR=1.56).This result agree to study conducted in Nepal (2018)86 that found the relation between thyroid test and AA Severity: abnormal thyroid function test was increased once the AA disease severity grade was increased but they were statistically not significant (p=0.021). However, earlier report suggested that the frequency of thyroid hormone has no clinical correlation with AA severity 93. Serarslan et al. also did not find the correlation between AA disease severity and personal and family history of autoimmune disease 94. Kasumagic et al. compared the frequency of thyroid autoantibodies (TgAb, TPOAb) in 70 AA patients and 30 healthy volunteers. Thyroid functional abnormalities were found in 8 (11.4%) AA patients and positive autoimmune antibodies were associated with AA in 18 (25.7%) patients, with no significant association between the disease severity and presence of these antibodies 95. However, the possible explanation for this different could be the difference in sample size and study setting .

Types of alopecia areata

The present study show 22% of cases have unilocularis alopecia areata. and the most prevalence was multilocularis 46% and (20% ,12% were totalis and universalis respectively). This result similar to study conducted by by Emina Kasumagic- (2008)95. That f ound the most prevalence was also multilocularis 53% and 19% was uniocularis type while the totalis and universalis were (17% and 11% respectively).

Regarding to relation of TSH with classification of alopecia, the result of study found significant association between abnormal result of TSH with specific types of alopecia (p= 0.047) the result reveled that abnormal TSH level was more in multilocualris type of alopecia areata while there are no any significant association between classification of alopecia areata and T3,T4 level (p=0.101 and p=0.099 respectively).

Limitation

The present study has its limitations. Screening for thyroid was based on TSH and T3,T4 which are good markers for the purpose. It was not followed-up with additional tests as many of the patients could not afford the cost. Acanthosis nigricans patients in our study were commonly urban residents. Consistently, Dassanayake et al [11] study in Sri Lanka stated that AN is highly predominant in urban areas with benefit of predicting the metabolic disorders.

V. CONCLUSION

There is significant association of alopecia areata with thyroid dysfunction, as evidenced by increased prevalence of thyroid dysfunction in individuals with alopecia areata compared to the healthy controls. Though thyroid dysfunction was more in individuals with mild to moderate form of alopecia areata.

REFERENCES

[1] Rantuccio F, Mastrolonardo M, Conte A. Area Celsi. Osservazioni personali e revisione della letteratura. G Ital Dermatol Venereol. 1995; 130:23-35

[2] Dawber R. Alopecia areata. Monogr Dermatol. 1989; 2:89-102

[3] Moreno GA, Ferrando J. Alopecia areata. Med Cutan Ibero Latina Americana. 2000; 28:294-31 2

[4] Dawber RPR, de Berker D, Wojnarowska F. Disorders of hair. In: Champion RH, Burton JL, Burns DA, Breathnach SM, editors. Textbook of dermatology. Oxford: Blackwell Science; 1998. p. 2919

[5] Ferrando Roqueta FJ, Corral Blanco C, Lobo Satue A, Grasa Jordan MP. Estudios clínicos y de laboratorios. Estudio de los fenómenos de estrés y su relación con variables psicopatológicas, clínicas e imunológicas en pacientes com alopacia areata. Actas Dermatosifiliogr. 1996; 87:597-609

[6] .Price V. Alopecia areata: clinical aspects. J Invest Dermatol. 1991; 96: 685

[7] 7.Camacho F. Alopecia areata: clinical features. Dermatopathology. In: Camacho F, Montagna W, editors. Trichology: diseases of the pilosebaceus follicle. Madrid: Aula Medica Group; 1997. p.417-40.

[8] 8.Buffoli B, Rinaldi F, Labanca M et al. The human hair: from anatomy to physiology. Int J Dermatol 2014;53: 331–341.

[9] 9.De Berker D, Higgins CA, Jahoda C et al. Biology of hair and nails. In: Bolognia JL, Jorrizzo JL, Schaffer JV, editors. Dermatology. 3 ed. Elsevier Saunders Ltd. 2012. pp.1075–1092.

[10] 10.Cotseralis G, Botchkarev V. Biology of hair follicle. In: Wollf K, Goldsmith LA, Katz SI, editors. Fitzpatrik's Dermatology in General Medicine. 7th ed. New York: Mc Graw Hill.2008. pp. 739–749

[11] 11.Hardy MH. The secret life of the hair follicle. Trends Genet 1992;8:55–61

[12] 12.Paus R, Cotsarelis G. The biology of hair follicle. N Engl J Med 1999;341:491–497

[13] 13.Miller SE. Molecular mechanisms regulating hair follicle development. J Invest Dermatol 2002;118:216–225.

[14] 14.Andl T, Reddy ST, Gaddapara T et al. WNT signals are required for the initiation of hair follicle development. Dev Cell 2002;2:643–653

[15] 15.Krause K, Foitzik K. Biology of hair follicle: the basics. Semin CutanMed Surg 2006;25:2–10. Anatomy and Physiology of Hair http://dx.doi.org/10.5772/67269

[16] 16.De La Mettrie R, Saint-Leger D, Loussouarn G et al. Shape variability and classification of human hair: a worldwide approach. Hum Biol 2007;79:265–281.

[17] 17.Otberg N, Richter H, Schaefer H et al. Variation of hair follicle size and distribution in different body sites. J Invest Dermatol 2004;122:14–19.

[18] 18.Sperling LC: Hair anatomy for the clinician. J Am Acad Dermatol 1991;25:1–17 .

[19] 19.Wolfram LJ. Human hair: a unique physicochemical composite. J Am Acad Dermatol 2003;48:S106–S114 .

[20] 20.Messenger AG, De Berker DAR, Sinclair RD. Disorders of hair. In: Burns T, Breathnach S, Cox N, editors. Rook's Textbook of Dermatology. 8 ed. Oxford:Wiley-Blackwell. 2010. pp.66.1–66.16 .

[21] 21.Jones LN. Hair structure anatomy and comparative anatomy. Dermatol Clin 2001;19:95–103 .

[22] 22.Randal VA, Botchkareva NV. The biology of hair growth. In: Ahluwalia GS, editor. Cosmetic Application of Laser and Light based system. Norwich, NY: William Andrew 2009. pp. 3–35.

[23] 23.Blume-Peytavi U, Vogt A. Human hair follicle: reservoir function and selective targeting. Br J Dermatol 2011;165:13–17 .

[24] 24.Oshima H, Rochat A, Kedzia C et al. Morphogenesis and renewal of hair follicles from adult multipotent stem cells. Cell 2001;104:233–245 .

[25] 25.Ito M, Kizawa K, Hamada K et al. Hair follicle stem cells in the lower bulge form the secondary germ, a biochemically distinct but functionally equivalent progenitor cell population, at the termination of catagen. Differentiation 2004;72:548–557 .

[26] 26.Peus D, Pittelkow MR. Growth factors in hair organ development and the hair growth cycle. Dermatol Clin 1996;14:559–572 .

[27] 27.Christoph T, Müller-Röver S, Audring H et al. The human hair follicle immun system: cellular compositon and immun privilage. Br J Dermatol 2000;142:862–873 .

[28] 28.Stenn KS, Paus R. Controls of hair follicle cycling. Physiol Rev 2001;81:449–494 .

[29] 29.Kligman AM. The human hair cycle. J Invest Dermatol 1959;33:307–316 . .

[30] 30.Paus R, Foitzik K. In search of the "hair cycle clock": a guided tour. Differentiation 2004;72:489–511 .

[31] 31.Greco V, Chen T, Rendl M et al. A two-step mechanism for stem cell activation during hair regeneration. Cell Stem Cell 2009;4:155–169.

[32] 32.Paus R. Principles of hair cycle control. J Dermatol 1998;25:793–802

[33] 33.Smoller BR, Horn TD. Dermatopathology in systemic disease. Oxford: Oxford University Press, 2001. p. 183-5 .
[34] 34.Odom RB, James WD, Berger TG. Andrews' diseases of the skin. Philadelphia: W.B. Saunders Company, 2000. p. 943-52 .
[35] 35.Lookingbill DP, Marks JG. Principles of dermatology. Philadelphia: W.B. Saunders Company, 2000. p. 303-14 .
[36] 36.Parker F. Skin diseases. In: Goldman L, Bennett JC, editors. Goldman: Cecil textbook of medicine. Philadelphia: W.B.Saunders Company, 2000. p. 2293-4.October 2002 .
[37] 37.Pimentel ERA. Alopecia areata. Aspectos imunológicos e tratamento pelo DNCB. [Tese]. Universidade de São Paulo; 1988 .
[38] 38.Safavi K. Prevalence of alopecia areata in the First National Health and Nutrition Examination Survey (letter). Arch Dermatol. 1992; 128:702.
[39] 39.Rivitti EA. Alopecia areata: revisão e atualização Alopecia areata: a revision and update. An Bras Dermatol. 2005;80(1):57-68 .
[40] 40.Safavi KH, Muller SA, Suman VJ, Moshell AN, Melton LJ. Incidence of alopecia areata in Olmsted County, Minnesota, 1975 through 1989. Mayo Clin Proc. 1995;70:628-33 .
[41] 41.Shapiro J, Modani S. Alopecia areata: diagnosis and management. Int J Dermatol. 1999; 38:19-24 .
[42] 42.Tosti A, Fanti PA, Morelli R, Bardazzi F. Trachyonichia associated with alopecia areata: a clinical and pathological study. J Am Acad Dermatol. 1991; 25:266-70.
[43] 43.Bergner T, Donhauser G, Ruzicka T. Red lunula in severe alopecia areata. Acta Dermato Venereol (Stockh). 1992; 72:203-5.
[44] 44.Muller SA, Winkelmann RK. Alopecia areata: anevaluation of 736 patients. Arch Dermatol. 1963; 88:290-7 .
[45] 45.Shellow WV, Edwards JE, Koo JY. Profile of alopecia areata: a questionnaire analysis of patient and family. Int J Dermatol. 1992; 31:186-9 .
[46] 46.Scerri L, Pace JL. Identical twins with identical alopecia areata. J Am Acad Dermatol. 1992; 27:766-7 .
[47] 47.Du Vivier A, Munro DD. Alopecia areata, autoimmunity and Down's syndrome. Br Med J. 1975; 1:191-4
[48] 48.Zauli D, Veronesi S, Fusconi M, Lama L, Melino M, Tosti A. Autoantibodies in alopecia areata. Br J Dermatol. 1984; 111:247 .
[49] 49.Hoffmann R, Eicheler W, Huth A, Wenzel E, Happle R. Cytokines and growth factors influence hair growth in vitro: possible implications for the pathogenesis and treatment of alopecia areata. Arch Dermatol Res. 1996; 288:153-6 .
[50] 50.Tan, E., Tay, Y.-K., Goh, Ch.-L., et al, 2002. The pattern of alopecia areata in Singapore – a study of 219 Asians. Int. J. Dermatol. 41, 748–753.
[51] 51 .Amin SS, Sachdeva S. Alopecia areata: A review. Journal of the Saudi Society of Dermatology & Dermatologic Surgery. 2013 Jul 1;17(2):37-45 . .
[52] 52.Al-refu K. Scalp Biopsy and Diagnosis of Common Hair Loss Problems. InSkin Biopsy-Diagnosis and Treatment 2013 Jul 3. Intech Open.
[53] 53.Olsen, E.A., Hordinsky, M.K., Price, V.H., Roberts, J.L., Shapiro, J., Canfield, D., et al, 2004. National alopecia areata foundation. Alopecia areata investigational assessment guidelines. Part II. National Alopecia Areata Foundation. J. Am. Acad. Dermatol. 51, 440–447.
[54] 54.Ay Se, Kavak, Can, Baykal, Guzin, Ozarmagan, et al, 2000. HLA in alopecia areata. Int. J. Dermatol. 39, 598.
[55] 55.Bark-Lynn Lew, M.D., Min-Kyung Shin, M.D., Woo-Young Sim, 2009. Acute diffuse and total alopecia: a new subtype of alopecia areata with a favorable prognosis. J. Am. Acad. Dermatol. 60 (1), 85–93
[56] 56.Garcia-Hernandez, M.J., 2000. CFM. Atypical clinical forms of alopecia areata. In: Camacho Francisco, M.R., Price Vera, H. (Eds.), Hair and its Disorders: Biology, Pathology, and Management. Martin Dunitz, London, pp. 228–231.
[57] 57.Ragunatha, S., Inamadar, A.C., Palit, A., Sampagavi, V.V., Deshmukh, N.S., 2008. Diffuse nonscarring alopecia of scalp: an indicator of early infantile scurvy? Pediatr. Dermatol. 25 (6), 644–646.
[58] 58.Shimmer, B.P., Parker, K.L., 2001. Goodman's and Gillman's: the Pharmacological Basis of Therapeutics. McGraw-Hill, New York (pp. 1661–1663)
[59] 59.Hunt N, McHale S. The psychological impact of alopecia. BMJ. 2005;331(7522):951-3. Epub 2005/10/22
[60] 60.Maia CP & Fernandes NC. Tratamento da alopecia areata com corticóide tópico: Estudo prospective randomizado duplo cego em crianças. An bras Dermatol. 2003; 78:63-71
[61] 61.Ross, E.K., Shapiro, J., 2005. Management of hair loss. Dermatol. Clin. 23, 227–243
[62] 62.Tosti, A., Piraccini, B.M., Pazzaglia, M., et al, 2003. Clobetasol propionate 0.05% under occlusion in the treatment of alopecia totalis/universalis. J. Am. Acad. Dermatol. 49, 96–98
[63] 63.Dickerman, R.D., Jaikumar, S., 2001. The hiccup reflex arc and persistent hiccups with high dose anabolic steroids: is the brainstem the steroid – responsive locus? Clin. Neuropharmacol. 24, 62–64
[64] 64.Madani, S., Shapiro, J., 2000. Alopecia areata update. J. Am. Acad. Dermatol. 42, 549–566
[65] 65.Buhl AE. Minoxidil's action in hair follicles. J Invest Dermatol. 1991; 96(Suppl):73S-4S
[66] 66.Mohamed, Z., Bhouri, A., Jallouli, A., et al, 2005. Alopecia areata treatment with a phototoxic dose of UVA and topical 8- methoxypsoralen. J. Eur. Acad. Dermatol. Venereol. 19, 552–555
[67] 67.Ellis CN, Brown MF, Voorhees JJ. Sulfasalazine for alopecia areata. J Am Acad Dermatol. 2002; 46:541-4
[68] 68.Joshi SR. Laboratory evaluation of thyroid function. JAPI 2011; 59:14
[69] 69.Larry-Jameson, J., and A. P. Weetman. "Harrison's Endocrinology " (2010)
[70] 70.Di Lauro R, De Felice M. Thyroid gland: anatomy and development. Endocrinology. Philadelphia: Saunders. 2001:1268-78
[71] 71.Bursuk E. Introduction to Thyroid: Anatomy and Functions. InThyroid and Parathyroid Diseases-New Insights into Some Old and Some New Issues 2012 Mar 7. IntechOpen
[72] 72.Venter JC, Adams MD, Myers EW, Li PW, Mural RJ, Sutton GG, Smith HO, Yandell M, Evans CA, Holt RA, Gocayne JD. The sequence of the human genome. science. 2001 Feb 16;291(5507):1304-51
[73] 73.Roy EW, Sharon YW, Samuel R. Diagnostic Tests of the Thyroid, In: De Groot LJ, Leslie J, Jameson JL et al, eds. Endocrinology, volume 2, 5th edition. USA: Elsevier Saunders, 2006, pp1899-1913
[74] 74.Chonchol M, Lippi G, Salvagno G, Zoppini G, Muggeo M, Targher G. Prevalence of subclinical hypothyroidism in patients with chronic kidney disease. Clin J Am SocNephrol 2008;3:1296-300. CrossRef
[75] 75.Ekins R. Measurement of free hormones in blood. Endocrine Rev 1990;1:5-6. –8
[76] 76.Fitzgerald PA. Endocrinology, Disease of Thyroid gland. In: Maxin AP, Stephen JMP, Lawrence M et al, eds. Current Medical diagnosis and treatment, 49th edition. USA: McGraw Hill publication; 2007, pp 1138-1142.
[77] 77.Koutras DA. Disturbances of menstruation in thyroid disease. Ann NY AcadSci 1997;816:280-284. CrossRef

[78] 78.Welle S, O' Connell M, Danforth E Jr, Campbell R. Decreased free fraction of serum thyroid hormones during the carbohydrate overfeeding. Metabolism1984;33:837-9. CrossRef

[79] 79.Surks MI, Chopra IJ, Mariash CN, Nicoloff JT, Solomon DH.American Thyroid Association Guidelines for use of laboratory tests in thyroid disorders. JAMA 1990;263:1529-32. CrossRef

[80] 80.Szkudlinski MW, Kazlauskaite R, Weintraub BD. Thyroidstimulation Hormone and Regulation of thyroid Axis, In: DeGroot LJ, Leslie J, Jameson JL et al, 5eds. Endocrinology, volume 2. USA: Elsevier Saunders, 2006. pp1803-60

[81] 81.Wartofsky L, Dickey RA. Controversy in clinical endocrinology: the Evidence for a narrower thyrotropin reference range is compelling. J Clin Endocrin Metab 2005;90:5483-8. CrossRef

[82] 82.Haarburge D. Thyroid disease: thyroid function tests and interpretation CMEJ 2012:30. Available at URL http://www.cmej.org.za/index.php/cmej/article/view/2515/2432.

[83] 83.Safer JD. Thyroid hormone action on skin. Dermatoendocrinol. 2011 Jul-Sep;3(3):211-15. doi: 10.4161/derm.3.3.17027.

[84] 84.Shapiro J, Hordinsky M. Evaluation and diagnosis of hair loss. Callen J, ed. UpToDate. Walthmam, MA: UpToDate Inc

[85] 85.You HR, Kim SJ. Factors associated with severity of alopecia areata. Annals of dermatology. 2017 Oct 1;29(5):565-70

[86] 86.Marahatta S, Agrawal S, Mehata KD. Alopecia Areata and Thyroid Dysfunction Association-A Study from Eastern Nepal. Kathmandu University medical journal (KUMJ). 2018;16(62):161-5

[87] 87.Thomas EA, Kadyan RS. Alopecia areata and autoimmunity: A clinical study. Indian J Dermatol. 2008;53:70-4

[88] 88.Lyakhovitsky A, Shemer A, Amichai B. Increased prevalence of thyroid disorders in patients with new onset alopecia areata. Australas J Dermatol. 2015; 56: 103-6

[89] 89.Ahmed I, Nasreen S, Jehangir U, Wahid Z. Clinical spectrum of alopecia areata and its association with thyroid dysfunction. J Pak Assoc Dermatol. 2012;22: 207-12

[90] 90.Bakry OA, Basha MA, El Shafiee MK, Shehata WA. Thyroid disorders associated with alopecia areata in egyptian patients. Indian J Dermatol 2014; 59: 49-55

[91] 91.Seyrafi H, Akhiani M, Abbasi H, Mirpour S, Gholamrezanezhad A. Evaluation of the profile of alopecia areata and the prevalence of thyroid function test abnormalities and serum autoantibodies in Iranian patients. BMC Dermatol 2005; 5: 11

[92] 92.Jabbour SA. Cutaneous manifestations of endocrine disorders: a guide for dermatologists. Am J Clin Dermatol 2003; 4: 315-331

[93] 93.Cunliffe WJ, Hall R, Stevenson CJ, Weightman D. Alopecia areata, thyroid disease and autoimmunity. Br J Dermatol 1969; 81: 877-881

[94] 94.Serarslan G, Savaay N, Yenin JZ. Is atopy and autoimmunity more prevalent in patients with alopecia areata? A comparative study. J Eur Acad Dermatol Venereol 2012; 26: 720-723

[95] 95.Kasumagia-Halilovia E. Thyroid autoimmunity in patient with alopecia areata. Acta Dermatovenerol Croat 2008; 16 123-12

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