Open Access Maced J Med Sci **electronic publication ahead of print, published on June 11, 2017 as https://doi.org/10.3889/oamjms.2017.050**

ID Design 2012/DOOEL Skopje, Republic of Macedonia
Open Access Macedonian Journal of Medical Sciences.
https://doi.org/10.3889/oamjms.2017.050
eISSN: 1857-9655
Clinical Science

Association among Thyroid Dysfunction, Asthma, Allergic Rhinitis and Eczema in Children with Alopecia Areata

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Citation: Ghaffari J, Rokni GR, Kazeminejad A, Abedi H. Association among Thyroid Dysfunction, Asthma, Allergic Rhinitis and Eczema in Children with Alopecia Areata. Open Access Maced J Med Sci. https://doi.org/10.3889/oamjms.2017.050

Keywords: Alopecia areata, Atopic dermatitis, Allergic rhinitis, children, asthma.

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Received: 18-Feb-2017; **Revised:** 29-Apr-2017; **Accepted:** 03-May-2017; **Online first:** 11-Jun-2017

Funding: This study was supported financially by Research deputy of Mazandaran University of Medical Sciences.

Competing Interests: The authors have declared that no competing interests exist.

Abstract

BACKGROUND: Alopecia areata is a non-scarring hair loss, which typically starts quickly. Atopy is one of the possible predisposing risk factors for this condition.

AIM: This study aimed to evaluate the prevalence of thyroid disease, atopic dermatitis and allergic diseases in children with alopecia areata and compare the results with healthy individuals.

METHODS: This case-control study was conducted on 50 patients with alopecia areata, diagnosed by a dermatologist, and 150 healthy individuals as the control group. Participants filled the questionnaires, and necessary tests were performed.

RESULTS: In this study, the mean age of the participants was 2.55 ± 14.26 and 3.19 ± 11.92 in the case and control groups, respectively. Prevalence of asthma was 22% in the case group and 12.5% in control group (P = 0.109). Also, allergic rhinitis and eczema were observed in 20% and 22% of the subjects of the case group, whereas they were reported to be 8% and 10% in the control group (PV = 0.03 and 0.175, respectively). Moreover, 28% and 8% of the participants in the case and control groups had a family history of atopy and allergic disorders, respectively (P = 0.046). A significant difference was observed between the two groups regarding gender, type of delivery and contact with animals.

CONCLUSIONS: According to the results of this study, a significant association was observed between the prevalence of alopecia areata and atopic conditions, such as allergic rhinitis and history of atopic dermatitis.

Introduction

Alopecia areata (AA) is a complex genetic, immune-mediated disease that targets hair follicles. The disease affects children and adults and is characterised by round or oval patches of hair loss, loss of all scalp hair (alopecia total), body hair (alopecia universal) or opiates pattern hair loss [1]. AA could be associated with asthma, allergic rhinitis, atopic dermatitis, thyroid disease and autoimmune diseases (e.g., thyroiditis and vitiligo). Also, there is no known racial, ethnic, or gender preponderance for this disease. Lack of permanent injury at the hair follicle could lead to maintaining of its potential to regrow hair.

Allergic disorders such as allergic rhinitis (AR), asthma and atopic dermatitis have been increasing over the past decades. Immunologic factors could be contributed in both AA and allergic disorders. The treatment of allergic disorders may be resolved the AA [2-4].

Several studies have reported an association between AA and atopic diseases [5]. In this regard, Regina, et al. (2007) confirmed an association between AA and atopic dermatitis for the groups of patients suffering from atopic dermatitis with asthma and atopic dermatitis with asthma and allergic rhinitis [6]. AA is typically associated with increased overall risk of autoimmune disorders, thyroid autoantibodies, as an autoimmune phenomenon, and thyroid diseases [7]. But based on available databases, no previous studies were done on this topic in Iranian children under 18 years old.

So with this background in mind, this case-control study aimed to determine the association among thyroid dysfunction, asthma, allergic rhinitis and eczema in children with Alopecia Areata.

Material and Methods

This case-control study was performed on 50 children aged <18 years with Alopecia Areata who referred to Bou Ali Sina Hospital, Sari, Mazandaran Province, in Iran. Alopecia Areata was diagnosed by an expert dermatologist through history taking and physical examination. Exclusion criteria for the both case and control groups were (i) taking vitamin A, (ii) consuming immunosuppressive medications, and (iii) having kidney, liver or any chronic diseases. Asthma and allergic rhinitis were diagnosed in the participants by a pulmonologist and an Otto-rhino-laryngologist, respectively. On the other hand, 150 healthy subjects were selected from the control group, who had no history of AA and were not blood-relate to patients with AA.

Data collection

Data collected from all the participants included age of AA onset and self-reported history, age of onset of allergic diseases and thyroid diseases, previous contact with animals, smoking status, history of allergic diseases in the patients or their families, history of thyroid disease and allergic diseases (e.g., asthma, atopic dermatitis and allergic rhinitis). This scale was distributed to 10 experts of the associated university of medical sciences and requested to add their comment about that. Then after submission of comments, content validity was proved.

After data collection, blood eosinophil count, serum Ig E, TSH and T4 were evaluated in all of the subjects.

Statistical methods

Data analysis was performed in SPSS version 12 using descriptive statistics, t-test, Chi-square and Fisher's exact test to compare the differences between subjects of the case and control groups. Also, conditional logistic regression was applied due to the presence of interferences.

Ethical considerations

This study was conducted according to the Declaration of Helsinki after receiving the approval from the institutional ethics committee [8].

Results

The demographic profile of participants in the two groups was presented in Table 1. According to the results, the two groups were similar in most of the variables.

Table 1: Demographic profile of participants

Variables	Groups		*P*-value
	Case	Control	
Age	14.26 ± 2.55	11.92 ± 3.19	0.238
Sex			
Male	37 (74%)	77 (52%)	0.005
Female	13 (26%)	73 (48%)	
Resident			
Urban	36 (72%)	120 (80%)	0.129
Rural	14 (28%)	30 (20%)	
Animal contact			
Yes	15 (30%)	69 (46%)	0.047
No	35 (70%)	81 (54%)	
Smoking family member			
Yes	16 (32%)	30 (20%)	0.143
No	34 (68%)	120 (80%)	

Regarding asthma, 11 (22%) and 19 (12.5%) subjects of the case and control groups suffered from this condition, respectively. However, the difference between the groups was not significant (P = 0.109). Regarding allergic rhinitis, 10 (20%) subjects of the case group and 13 (8%) participants of the control group were diagnosed with allergic rhinitis, and the difference between the studied groups was statistically significant (P = 0.040). On the other hand, 11 (22%) subjects of the case group and 16 (10%) participants of the control group suffered from atopic dermatitis, which revealed a significant difference between the groups in this regard (P = 0.175). Also, 14 (28%) and 12 (8%) subjects of the case and control groups had a family history of allergic diseases, respectively, and the difference between the groups was significant (P = 0.046).

Another studied variable in this study was thyroid problems. In this regard, eight (16%) subjects of the case groups suffered from hypothyroidism, one had hyperthyroid (2%), and other 41 (82%) participants had no thyroid problems. On the other hand, 12 (8%) subjects in the control group had hypothyroidism, two had hyperthyroid (1.3%), and 136 (90.7%) participants had no thyroid history. These results revealed no significant difference between the subjects (P = 0.260). Regarding the level of IgE, 18 (36%) subjects of the case group had high levels of IgE, and other 32 (64%) participants were within the normal range (0-200 U/ml). In the control group, 23 (15%) subjects had high levels of IgE, and other 127 (85%) participants were within the normal range.

In this regard, a significant difference was observed between the groups (P = 0.004). Mean IgE in the case and control groups was 138.89 ± 168.06 and 112.07 ± 134.11, respectively. Regarding the level of blood eosinophil, 19 (38%) subjects of the case group had high levels of blood eosinophil, and 31 (62%) participants were in the normal range (< 400 per cubic millimetre of blood). In the control group, 18 (12%) participants had high levels of blood eosinophil, and 132 (88%) subjects were in the normal range. According to these results, a significant difference was observed between the groups (P = 0.002). Mean eosinophil in the case and control groups was 161.15 ± 269.26 and 127.28 ± 199.73, respectively.

Discussion

AA has been considered as an autoimmune disease due to T cell response against hair follicle self-antigens [9]. This condition might occur as early as the first month of life or as late as the late seventies. Nevertheless, our study was conducted on patients aged <18 years. AA has been reported to be related to the genetic constitution of the patient, atopic state, nonspecific immune and organ-specific autoimmune reactions and possibly emotional stress [10]. This autoimmune aetiology has been proposed by the association between AA and various autoimmune diseases and various underlying immunologic abnormalities, such as deposition of C3 in the affected sites of these patients [11]. AA is considered as an autoimmune disease caused by CD4+ and CD8+ T cells, invading immune-privileged anagen-stage hair follicles causing a loss of tolerance [12].

Atopy has occurred with increased frequency in patients with AA [13]. The prevalence of asthma, atopic dermatitis and hay fever among patients with AA has been reported to be 15%, 20%, and 25%, compared to 3.8%, 17.1%, and 20.9% reported in the general population, previously [14-16]. Inconsistent with previous studies, season et al. marked no significant difference between paediatric patients and the control group regarding the frequency of autoimmune and atopic diseases [11]. Similarly, our findings revealed no significant difference between the case and control groups regarding atopic dermatitis.In a systematic review showed that Patients with AA, especially alopecia total or alopecia universal, have significantly increased the risk for AD [17].

Thomas et al. demonstrated increased frequency of atopy in association with AA [18]. According to the results of the mentioned study, among the cutaneous diseases associated with AA, atopic dermatitis showed the maximum frequency with an odds ratio of 2.5. These results revealed that atopic dermatitis is two to three times more common in patients with AA [18]. AA and atopy share a Th2 cytokine pattern and increased levels of IgE antibodies, mast cells, and eosinophils [19].

In a study by Chu et al., a significant correlation was observed between vitiligo, lupus erythematosus, psoriasis, atopic dermatitis, thyroid diseases, allergic rhinitis, asthma and alopecia areata [20]. According to their results, a significant relationship was found between AA and conditions of atopic dermatitis and autoimmune diseases. In a case-control study by Barahmani et al., 2613 individuals were evaluated (case = 2055 and control = 558). Results obtained by this study indicated that the history of atopy and allergic diseases led to increased risk of AA [21]. Also, it was mentioned that individuals with a history of atopy or hypothyroidism had a statistically significant elevated risk of AA, compared to the other subjects [22].

In a study by Kaur and Sharma et al., 50% of patients had a history of atopy, and allergic rhinitis was the most common condition observed in 42 patients or first degree relatives, followed by bronchial asthma in six subjects and atopic dermatitis in two participants. In congruence with the mentioned results, our study revealed a statistically significant difference between two groups regarding allergic rhinitis but not asthma. It is possible that severity of associated atopic disorders is a critical factor in determining the severity of AA, other than the mere presence of an atopic disorder [23].

According to the results of the current research, a significant relationship was found between AA and variables of allergic rhinitis and history of allergic diseases. In patients with AA, the level of allergic rhinitis and history of allergic diseases were more detected, and no significant association was observed between AA and conditions of asthma and atopic dermatitis. In previous studies, atopic dermatitis was related to AA, compared to allergic rhinitis and asthma. In this study, allergic rhinitis had the highest association with AA. Brahmani and et al. expressed that patients with a history of any atopy had a two-fold risk of AA, and individuals with a history of atopic dermatitis specifically had increased risk of having AA by 70% [21].

According to the results of the present study, the prevalence of allergic rhinitis and atopic dermatitis in the control group was 10.7% and 8.7%, respectively. Considering the higher prevalence of allergic rhinitis and eczema, and the economic costs imposing on family and society, which have adverse effects on quality of life and ignorance of some families about the symptoms of this disease, awareness of parents should be raised toward the risks and consequences of AA in the future life of their children.

In the present study, no significant association was observed between AA and variables of the place of residence (city or village), smoking family member, history of asthma, history of atopic dermatitis, history of thyroid problems and alopecia areata. However, a significant association was observed between this disease and variables of animal contact, history of allergic rhinitis, allergic disease, gender, the level of IgE and eosinophil level.

Serarslan et al., reported no statistically significant relationship between AA and variables of age, gender, place of residence, thyroid disease and animal contact [11]. According to the results of the mentioned study, no difference was observed between the study groups regarding the frequency of autoimmune and atopy. Also, mean age in the subject and control groups were 14.26 ± 2.55 and 11.92 ± 3.19, respectively, and the age structure was similar in both groups (P = 0.238). In this study, a significant

association was found between animal contact and suffering from AA (P = 0.047). In other words, those who suffer from AA were more in contact with animals, compared to other participants. This is probably because of contact with animal results in increased prevalence of allergic diseases and incidence of AA. In the study above, no significant relationship was observed between the place of residence and the risk of AA (P = 0.129). Moreover, no significant correlation was observed in the study by Serarslan and et al. [11].

In the present study, no significant association was observed between smoking and the risk of AA, whereas the frequency of smoking was higher in patients with AA (30% and 20% in case and control groups, respectively). Smoking is a risk factor for asthma, and the prevalence of allergic diseases is more observed in AA. Factors affecting AA include genetic diseases, atopy, autoimmune reactions and stressful conditions. This fact that stressful situations lead to more possibility of smoking in individuals, the higher prevalence of AA could be explained in these patients.

There is a main systemic association between autoimmune disease and thyroid abnormalities. Its incidence varies 8%-28% in patients with AA [24]. Consistent with our findings, Emy and et al. stated that hypothyroidism had the most frequent association with AA (14.1%) [18]. These results indicated that while the prevalence of hypothyroidism was higher in AA, the difference was not significant (P = 0.260). In the study above, six of eight cases with hypothyroidism were female, indicating that female with AA suffer more from hypothyroidism. Therefore, this issue requires further studies. Due to the significant association of thyroid disorders in patients with AA, it is recommended that thyroid function of all patients with AA, especially women and children, be tested and as needed it's treated. The results of our study have shown a significant association between AA and allergic rhinitis, animal contact, family history of allergic diseases, gender, serum IgE level and some blood eosinophils. Other factors revealed no significant relation.

The main limitation of this study is small sample size. Also, other factors including geographical, environmental and cultural conditions could be effective on the results. Given the limited number of studies on above-mentioned factors in Iran, our results are of paramount importance. Nevertheless, it is recommended that future studies be conducted at longer intervals.

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