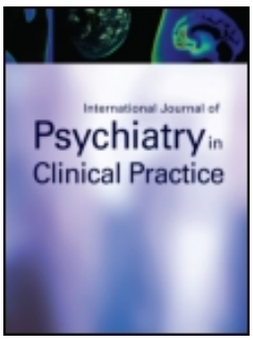

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ORIGINAL ARTICLE

Investigation of attention deficit and hyperactivity disorder in adult patients with atopic dermatitis

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Abstract

Background. Atopic dermatitis (AD) is a common chronic inflammatory disease that is associated with significant psychosocial morbidity and a decrease in health-related quality of life. Attention deficit hyperactivity disorder may be present in atopic dermatitis patients. *Objective.* The present study aims to investigate the co-presence of ADHD in adult patients with AD. *Material and method.* The study registered 60 adult patients with AD (48 females and 12 males) and 50 non-atopic control subjects (38 females and 12 males). The AD patient group and the control group were assessed using the Turgay adult Attention-Deficit/Hyperactivity Disorder (ADD/ADHD) DSM-IV-Based Diagnostic Screening and Rating Scale (Turkish Version), which was studied by a team of psychologists and psychiatrists in Turkey for validity, reliability and norms. The scale covers three dimensions of the disease, namely inattention, hyperactivity and impulsivity, and associated features of ADHD. The groups were compared and contrasted in terms of their similarities and differences in ADD/ADHD symptoms. *Results.* Three sub-dimensions of ADD/ADHD scale (Attention Deficit, Hyperactivity/ Impulsivity and Problem subdivisions) in AD patients were found statistically significantly elevated relative to controls ($P<0.001$, $P<0.001$, $P<0.001$, respectively). *Conclusions.* In conclusion we established the co-presence of ADHD in AD patients in the adult age group.

Key Words: *Atopic dermatitis, attention-deficit, hyperactivity disorder*

Introduction

Attention deficit hyperactivity disorder is a chronic psychiatric disorder with the basic symptoms of inattention, impulsivity and hyperactivity, starting in early childhood [1,2]. Although it is one of the most commonly studied disorders among childhood psychopathologies, our knowledge on adulthood ADHD is limited. Studies involving adolescents have shown that neuropsychological problems that are present in childhood do not disappear over time [3–10]. Of the individuals diagnosed as ADHD in childhood, 30–70% continue to experience marked difficulties in adulthood [7–10]. In the literature, the results of the papers studying the relationship between allergic diseases of childhood period are conflicting [4–7,11]. While some papers have reported a significant relationship between these diseases, other papers have reported that both diseases are independent of each other, therefore, the diseases may be related [4–7,11,12]. However, there is no study indicating such a relation in adult age group. In the present study we investigated the relation between atopic dermatitis (AD) and ADHD in adult patients with atopic dermatitis.

Patients and methods

The randomized study included 60 adult AD patients (48 females, 12 males and 36 active and 24 inactive) who were diagnosed in accordance with Hanifin Rajka classification [13]. Detailed histories

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of all patients, including personal and familial atopy histories, were taken and physical and dermatological examinations were conducted. The group of patients with AD was divided based on whether their AD was active or inactive. Patients with active dermatitis were evaluated as active, and those without were evaluated as inactive. Active patients had dry-scaling erythematous papules, plaques, lichenified plaques and weeping, crusting and exudative lesions in the flexural areas. The control group included 50 non-atopic subjects (38 females and 12 males) who presented at the Dermatology Clinic of Firat University with no personal or familial history of AD. Control subjects were examined dermatologically for the possibility of being an AD patient without skin indication. Inclusion criteria were being over 18 years of age and volunteering to participate in the study. Exclusion criteria included having psychiatric disorders with organic causes, such as brain trauma or viral encephalitis, being on antihistamine or corticosteroid treatment, which can cause attention deficit, and being mentally retarded to the extent of incapability to understand the test and to join interviews [14].

In addition to clinical interviews with the use of DSM IV ADHD Diagnostic Criteria, Turgay Adult ADHD Rating Scale was used to support the diagnosis of ADHD. Adult Attention Deficit Hyperactivity Disorder Diagnosis and Evaluation Scale (Adult ADD/ADHD DSM-IV-Based Diagnostic Screening and Rating Scale) was developed by Prof. Dr. Atilla Turgay, Director, Toronto ADHD Clinic, in U.S., Canadian and Turkish population, and was tested for validity, reliability, and normative data by Sennur Günay et al. [15]. It is a self-assessment scale where the patient, after being duly informed, can complete the questionnaire. When developing adult ADD/ADHD Scale, 18 symptoms of the diagnostic criteria in DSM-IV were reframed for patient understanding. The first part of this scale has 9 inattention questions, and the second part has 9 hyperactivity/impulsivity questions. The third part of the scale consisted of the most frequently associated symptoms in ADHD that were not in DSM-IV ADHD diagnostic criteria. The severity and frequency of the symptoms were placed on a Likert scale with 0,1,2 and 3 describing 'not at all', 'just a little', 'pretty much' and 'very much'. "Pretty much" and "very much" ratings were considered "clinically significant". In the development of cut off scores, stratified sampling of normative population findings were compared to "ADHD Clinic" and "Mood Disorder Clinic" patients. ADHD risk calculation was based on ADHD Rating Scale scores:

- Part 1, Inattention (score: 0–27):
  - <3 low risk
  - 3.01–10.99 medium risk
  - point-score >11 high risk for ADHD inattentive type.
- Part 2, Hyperactivity/Impulsivity (score: 0–27):
  - <3 low risk
  - 3.01–10.99 medium risk
  - point-score >11 high risk for ADHD hyperactive/impulsive type.
- Part 3, associated features (score:0–90):
  - 0–12.99 low risk
  - 13–35 medium risk
  - 35–75 high risk

Overall total: Score: 0–144
- <20 low risk
- 20–59 high risk
- point-score>59 high risk for ADHD associated symptoms.

When scoring the test, an individual who scored 2 or 3 in at least six out of nine questions in the first part is considered to have inattention. Similarly, an individual who scored 2 or 3 in at least six out of nine questions in the second part of the scale is considered to have hyperactivity/impulsivity (HA). The points for the questions and total scores were calculated in patient and control groups. At the end of the evaluation, the number of ADHD diagnosis, gender and the relationship with activity were assessed in the groups. Responses to the questions in the third part were added to find the score for characteristics associated with ADD/ADHD, as required in the scale.

Statistical analyses

After calculating general total and sub-scale mean scores, as well as standard deviations of the ADD/ADHD scale according to group factors, mean ADHD total and sub-scale scores were compared by group variable using an independent *t*-test. Correlation between sex and group (atopic and control) was studied using Yates-corrected Chi-square test. Values for which $P < 0.05$ were accepted statistically significant. The analyses were conducted using SPSS 15.0 for windows package software.

Results

The study included 60 AD patients (36 active and 24 inactive), and 50 not-atopic control subjects. The age range of the patients was between 19 and

39 years, with a mean age of 27.96 ± 6.3 years. Age range of controls was between 19 and 50 years and mean age was 27.82 ± 7.9 years. Sex distribution and mean ages of the patient and control groups were not statistically significantly different ($P > 0.05$). Distribution of age and sex by group variable is presented in Tables I and II.

When Turgay ADHD Scale general total and subscale mean scores were compared between the groups, there were considerable differences between active AD patient and control groups, and inactive AD patient and control groups for all sub-scales and for total scores ($p < 0.001$, $p < 0.001$, respectively). Conversely, no significant difference between active and inactive AD patient groups was observed ($p > 0.05$). With respect to gender, there were considerable differences between active patient and control groups, and inactive patient and control groups ($p < 0.001$, $p < 0.001$, respectively). In female patients, significant difference between active and inactive patient groups was not detected ($P > 0.05$). In male patients, while total score values were different only between active patient and control groups ($P = 0.05$), no significant differences were observed between active and inactive patient groups, and inactive patient and control groups ($P > 0.05$, $P > 0.05$ respectively) (Tables III and IV).

Nineteen patients (14 active and five inactive) in the atopic dermatitis group met the inattention criterion, and 20 patients (12 active and eight inactive) met the hyperactivity/impulsivity criterion. There were 12 AD (nine active and three inactive) patients meeting both the inattention and the hyperactivity/impulsivity criterions.

While three patients in control group met the inattention criterion, none met the hyperactivity/impulsivity criteria. Naturally, there were no patients meeting both criteria in control group. With respect to gender, although there were considerable differences between active patient and control groups, and inactive patient and control groups ($p < 0.001$, $p < 0.001$, respectively) in female patients, a significant difference between active and inactive patient groups was not detected ($p > 0.05$). In male patients, while total score values differed between active patient and control groups ($p = 0.02$), no significant differences were observed between active and inactive patient groups, and inactive patient and control groups ($p > 0.05$, $p > 0.05$, respectively) (Tables III, IV).

All three sub-dimensions of ADD/ADHD scale (Inattention, Hyperactivity/Impulsivity and Associated Features) were found to be statistically significantly higher in AD patients, compared to controls ($p < 0.001$, $p < 0.001$, $p < 0.001$, respectively). ADD/ADHD scale general total and subscale mean scores, as well as standard deviations by group variable are shown in Tables III and IV. The results obtained indicate that inattention and hyperactivity features were greater in AD patients.

Table I. Age distribution of atopic dermatitis patients and control subjects.

	Group Statistics				
Age (years)	Group	*n*	Mean	±SD	*P* value
	Atopic Dermatitis Patients	60	27.96	6.35	
	Control Subjects	50	27.82	7.95	0.91

Table II. Gender distribution of atopic dermatitis patients and control subjects.

	Group × Gender Cross-tabulation				
			Gender		
			Female	Male	Total
Group	Atopic Dermatitis Patients	*N*	48	12	60
		Group	80.0%	20.0%	100.0%
		Sex	55.8%	50.0%	54.5%
	Control Subjects	*N*	38	12	50
		Group	76.0%	24.0%	100.0%
		Sex	44.2%	50.0%	45.5%
Total		*N*	86	24	110
		Group	78.2%	21.8%	100.0%
		Sex	100.0%	100.0%	100.0%

Discussion

Conflicting data exist in the literature regarding the relationship between ADHD and atopy. Previous studies have usually focused on the role of food and additives in ADHD. Boris et al. reported recovery in children with ADHD whom they treated with multiple-item elimination diets [17]. Roth et. al. found an increase in the symptoms of ADD, evident from poorer performance on laboratory tests sensitive to attentional capacity and inhibitory functions, in 81 children with atopy (most of which were AD) [18]. They hypothesized that allergies caused ADHD due to imbalances in cholinergic/adrenergic activity in the central nervous system [14]. Similarly, there are a number of studies reporting a relation between allergy and ADHD in children [19–21]. Beyreiss et al. found that the prevalence of ADHD in children with various allergic diseases was 50.6% [19]. Interestingly, the same study also reported that the prevalence of ADHD was higher in the parents of allergic children (19.7%), relative to healthy controls [19].

Allergic rhinitis causes difficulty breathing and a decrease in sleep quality, which results in displays of

Table III. ADD/ADHD Turgay Scale total and sub-scale mean scores for each group.

		Active Patients	Inactive Patients	Control Subjects	*P*
N		36	24	50	
Gender (F/M)		30/6	18/6	38/12	>0.05
IAT	Female	12.70±6.61*	11.55±5.34**	5.0±3.91	<0.001
	Male	11.83±4.62	10.50±5.89	7.79±5.52	>0.05
	Total	59.22±21.32*	52.06±12.49**	32.18±16.09	<0.001
HAT	Female	13.96±8.56*	11.55±6.37**	4.63±2.43	<0.001
	Male	15.00±8.50	8.33±9.26	5.91±4.47	>0.05
	Total	59.82±12.23*	49.10±11.78**	31.75±15.50	<0.001
AFT	Female	41.23±20.85*	39.22±17.48**	7.27±9.11	<0.001
	Male	39.50±16.13	31.50±16.93	22.83±10.61	>0.05
	Total	59.38±12.37*	53.04±12.73**	32.07±16.73	<0.001
IAT+HAT+AFT	Female	67.90±32.59*	62.33±26.58**	26.86±13.03	<0.001
	Male	66.33±19.70*	50.33±30.51	36.50±18.02	<0.05
	Total	61.46±22.12*	53.90±12.93**	30.57±15.5	<0.001

*Active patient vs. control; **Inactive patient vs. Control.
IAT, inattention total (total severity of criteria marked positive by patients in part 1); HAT, hyperactivity total (total severity of criteria marked positive by patients in part 2); AFT, associated features total (total severity of criteria marked positive by patients in part 3); IAT+HAT+AFT, total severity of criteria marked positive by patients in parts 1, 2 and 3.

ADHD-like symptoms, such as daytime fatigue, inattention, irritability, and impulsivity. Previous studies have examined the relationship between allergic rhinitis and ADHD. Brawley et al. evaluated patient history of allergic rhinitis, findings of a physical examination, and the results of a skin prick test to common allergens. This study investigated the co-presence of allergic rhinitis in 30 patients in a pediatric psychiatry clinic that had been diagnosed with ADHD according to DSM IV diagnostic criteria [20]. Results showed that 80% of ADHD patients had at least 2 out of 6 symptoms of rhinitis. Interestingly, the same study also found that 53% of ADHD patients had associated atopic diseases like asthma and atopic dermatitis. All 28 patients whose family history could be obtained had atopy in their family history. Of the child patients with ADHD included in the study, 43% had signs of allergic rhinitis upon examination, 61% had at least one skin test positive for common aeroallergens, and 60% had both symptoms of allergic rhinitis and a positive skin test. Children with allergic rhinitis were observed to experience difficulty breathing and a decline in sleep quality, which were reported to cause symptoms like those of ADHD. Therefore, treatment of allergic rhinitis in children with ADHD would be beneficial to improve sleep and cognitive functions of the concerned children [20].

Table IV. ADD/ADHD Turgay Scale by group differences.

	Active Patients	Inactive Patients	Control Subjects	*P*
n	36	24	50	
Gender (F/M)	30/6	18/6	38/12	>0.05
Female	8.33±5.96*	6.64±4.56**	1.44±1.98	<0.001
Male	8.66±4.36*	5.66±6.50	3.00±2.96	0.04
Total	8.38±5.64*	6.37±4.88**	1.82±2.29	<0.001

*Active patient vs. control; **Inactive patient vs. Control.

In opposition to these findings, some researchers have not found a correlation between ADHD and atopic diseases [22–24]. McGee et al. did not establish any relation between history of allergic disease, response to skin prick test and serum IgE levels [23]. Likewise, Biederman et. al. could not detect any etiological or pathophysiologic relation between ADHD and asthma, reporting that both diseases were inherited independently of one another, and thus could be co-present [11]. Our study established that the co-presence of ADHD in adult patients with AD was statistically significantly higher than the group of control subjects.

The relation observed between allergic diseases and ADHD may stem from loss of norepinephrine from the hypothalamus during the process of intense immune reaction in allergic diseases [19,25]. This is consistent with hypotheses that ADHD is a (non) allergic hypersensitivity disorder caused by environmental factors, such as food and inhalants [24]. These environmental factors also play major roles in other complex genetic diseases, like asthma and eczema [26,27].

Attention deficit hyperactivity disorder has a diverse course of symptoms and is easier to diagnose in childhood. However, the form that the disorder develops might change over time in adults [28,29]. Hyperactivity in adults with ADHD may presents differently than children's hyperactivity. A child who runs or climbs in excess may engage in active jobs in adult years. An adult with ADHD can partially compensate for the problems caused by this disorder

Table V. Results of Independent samples t-test conducted for ADD/ADHD Turgay Scale total and sub-scale mean scores by group variable.

Variable	Mean Difference	Std. Error of Difference	95% Confidence Interval of the Difference	
			Lower	Upper
IAT	6.39	1.01	4.37	8.40
HAT	7.84	1.21	5.44	10.24
AFT	20.90	2.94	15.05	26.74
IAT+HAT+AFT	35.13	4.58	26.05	44.21

IAT: Inattention total (total severity of criteria marked positive by patients in part 1); HAT: Hyperactivity total (total severity of criteria marked positive by patients in part 2); AFT: Associated features total (total severity of criteria marked positive by patients in part 3); IAT+HAT+AFT: total severity of criteria marked positive by patients in parts 1, 2 and 3.

and can minimize the negative influences of the disease. Thus, ADHD is less easily recognised in adulthood [28,29], which parallels AD. The area affected by AD is wider during infancy and childhood, and AD may be located in a single area in adulthood, such as flexural sites or hand dermatitis [30]. The reason for not having significant differences in parameters between active and inactive patients may arise from more localized of AD in the adulthood period. This study demonstrated the co-presence of AD and ADHD in the adult age group. However, it would be more meaningful to carry out such a study in AD patients in childhood, which we were unable to do due to technical limitations. In conclusion, the possible co-presence of ADHD should be taken into considered in the treatment approach for patients with AD. We recommend screening adults with AD for possible presence of serious ADHD symptoms or ADHD as a comorbid disorder. The possible causes of this co-morbidity requires further research. Structured interviews and questionnaires with high sensitivity to the diagnosis of ADHD can be useful in general clinical practice [31–33].

Key points

Possible co-presence of ADHD should be considered in the approaches to patients with AD.

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Statement of Interest

The authors have no conflict of interest with any commercial or other associations in connection with the submitted article.

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