



Research Paper

Comorbidity of Adult Attention Deficit Hyperactivity Disorder With Acne Vulgaris



Ali Pourramzani¹ , Kaveh Gharaei Nejad^{2,3*} , Sara Fakhraei² , Atena Gholipour²

1. Kavosh Behavioral, Cognitive and Addiction Research Center, Shafa Hospital, Guilan University of Medical Science, Rasht, Iran.

2. Skin Research Center, Razi Hospital, Guilan University of Medical Sciences, Rasht, Iran.

3. Department of Dermatology, Faculty of Medicine, Guilan University of Medical Sciences, Rasht, Iran.



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Running Title ADHD and Acne Vulgaris

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ABSTRACT

Background: Based on research, acne vulgaris is associated with a high prevalence of attention deficit hyperactivity disorder (ADHD).

Objectives: This study investigates the comorbidity of ADHD and acne vulgaris in individuals with acne vulgaris who were referred to the Razi Dermatology Specialist Clinic and Beesat Clinic of Guilan University of Medical Sciences, Rasht City, Iran, in 2021.

Materials & Methods: This case-control study includes 85 individuals with acne vulgaris and 85 without acne vulgaris. The Conners' adult ADHD rating scales (CAARS) were used to evaluate ADHD symptoms. The study data were analyzed with SPSS software, version 24 at a significant level of <0.05.

Results: The Mean±SD age of the study participants was 35.12±13.19 years, and 64.1% of them (n=109) were women. Of the total participants, 7.6% had ADHD, and the frequency of ADHD in individuals with acne vulgaris compared to controls was 8.2% vs 7.1%, and this difference was not significant (P=0.773). The frequency of ADHD and the mean score of ADHD in individuals with acne vulgaris were higher in those aged ≤30, women, and severe types of acne, but this difference between the two groups was not statistically significant (P>0.05).

Conclusion: Our findings showed no statistically significant difference between subjects with acne vulgaris and the control group in the score and frequency of ADHD. Also, we found no statistically significant difference in the score and the frequency of ADHD based on the severity of acne vulgaris.

Keywords: Acne vulgaris, Attention deficit hyperactivity/disorder, Mental disorder, Skin diseases

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* Corresponding Author:

Kaveh Gharaei Nejad, Associate Professor.

Address: Skin Research Center, Razi Hospital, Guilan University of Medical Sciences, Rasht, Iran.

Tel: +98 (313) 313-9903, **Fax:** +98 (13) 3550028

E-mail: gharaeek36@gmail.com

Highlights

- The prevalence of attention deficit hyperactivity disorder (ADHD) in individuals with acne vulgaris was higher than in individuals without it.
- The prevalence of ADHD in individuals with acne vulgaris was higher in those aged ≤ 30 years.
- The prevalence of ADHD among women with acne vulgaris was higher than among those without acne vulgaris.
- The prevalence of ADHD increases with the increase in the severity of acne vulgaris.

Introduction

Acne vulgaris, or pimple, is the eighth most common skin disease worldwide, with an estimated prevalence of 9.38% across all age groups, according to the 2010 global burden of disease study [1]. The occurrence of acne vulgaris in adolescents and adults varies by country and ethnicity [2]. Acne can sometimes exhibit complex social and psychological effects, and patients experience severe issues with their body image, self-esteem, sociability, and even feelings, particularly anger [3]. Studies have indicated that while acne vulgaris is not life-threatening, it does have detrimental effects on individuals' body image perception. As a result, it can lead to feelings of anxiety, sadness, and difficulties in social interactions. Acne is commonly associated with psychological disorders such as anxiety and depression [4-6]. Some epidemiological studies reported that the prevalence of acne vulgaris is higher in individuals with attention deficit hyperactivity disorder (ADHD) [7, 8]. This disorder is a prevalent mental illness that typically manifests in childhood, but it can persist into adolescence and possibly adulthood, often coexisting with other psychiatric comorbidities [9]. The enhanced challenge in managing emotions experienced by young individuals with ADHD is believed to be a factor that connects ADHD and mental health disorders [10-12]. Furthermore, the attendance of ADHD is thought to be related to severe psychiatric problems in patients with acne vulgaris. Alternatively, the putative association between acne vulgaris and ADHD could be an indication of a common etiological risk factor for these disorders, like early-life exposure to higher androgen levels [9, 13]. There are few studies investigating the link between acne and ADHD with conflicting results [7, 14, 15]. These studies have used various diagnostic techniques and standards for ADHD, ranging from formal categorical approaches to multidimensional symptom checklists, which signifi-

cantly differ in their design and sample characteristics. Moreover, only a few studies have detailed variations in diagnostic propensity seen among different racial/ethnic groups. Psychiatric comorbidities with acne vulgaris are important because they can significantly impact the recommended treatments for patients with acne vulgaris, in addition to increasing the likelihood of negative effects on the patient's quality of life. To our knowledge, no research has been published in this part of Iran that looks into the connection between ADHD and acne vulgaris. In the present study, we aim to examine the comorbidity and prevalence of ADHD among individuals with acne vulgaris based on age, gender, and severity of acne vulgaris in the population of this region.

Materials and Methods

Study design and sample size

This case-control study was conducted on 85 individuals with acne vulgaris and 85 without it. According to the findings of the Davari-Ashtiani et al. study, the sample size was estimated with a 95% confidence level and 80% test power [16]. Based on the Conners' adult ADHD rating scales (CAARS) (hyperactivity: 14 ± 55), about 10% (6 scores) were determined for 85 individuals in each group. Initially, the participants were briefed on the study procedure, objectives, and outcomes. It was also clarified that the study process does not alter the course of treatment for the patients. The control group was selected from the patients' companions with the same age range as the case group. Participants will be placed in the control group if their medical history indicates that they have never had body or facial pimples or acne treatment. The case group was selected from individuals suffering from acne vulgaris who were referred to the Razi Dermatology Specialist Clinic and Beesat Clinic of Guilan University of Medical Sciences, Rasht City, Iran, in 2021. These individuals must have a history of acne

vulgaris or a diagnosis of acne vulgaris by a dermatologist. After obtaining informed consent in person, an online questionnaire containing demographic information (age, gender) and the CAARS scale for the examination of ADHD symptoms were provided to the individuals. For this scale, a cut-off point of 55 was used, which, according to Davari-Ashtiani et al. research, has good validity and reliability in Iranian society [16]. Also, in the prepared questionnaire, the history of childhood ADHD and its treatment approved by a physician is asked. ADHD was confirmed based on a questionnaire with the final approval of a psychiatrist.

A dermatologist diagnosed the severity of acne vulgaris in individuals. Based on the dermatologist's diagnosis, the severity of acne vulgaris in these patients was classified into three categories: Mild, moderate, and severe. The inclusion criteria included a diagnosis of acne vulgaris by a dermatologist, and the patients with underlying diseases and incomplete data or poor participation were excluded from the study.

Conners' adult ADHD rating scales (CAARS)

All kinds of CAARS grading are widely used worldwide. This study used the self-reporting version of CAARS to examine ADHD symptoms. This scale is available in a long-form containing 66 questions and a short form of 30 questions and is scored based on a Likert scale from 0 (not at all) to 3 (always). Both scales have good psychometric properties [17, 18]. CAARS short-form includes several scales to examine these factors (attention/memory problems and hyperactivity/restlessness, impulsivity/emotional disability, and self-concept problems) and two other scales (ADHD index and ADHD inconsistency index) [19].

This instrument used the fourth edition of the diagnostic and statistical manual of mental disorders to measure symptoms of ADHD. It uniquely integrates knowledge, clinical skills, and psychometric techniques. One of the strengths of this tool is that it is designed based on a significant statistical population. This questionnaire has 30 items and measures three groups of symptoms included in the DSM-IV: 9 items are designed for attention deficit, 9 items for hyperactivity/impulsivity, and 12 items are a set of ADHD symptoms as a separate subscale that is introduced as the ADHD index. According to the conducted studies, the questionnaire's test re-test reliability and internal consistency are adequate, and the correlation between the items has been satisfactory. With this questionnaire, the course of recovery can be measured, and it is used in medical centers due to its validity and

reliability. The CAARS-S mean reliability was 0.75, and the test re-test correlation was 0.80 [19]. Also, each of the three factors had a Cronbach α coefficient of 0.802, 0.758, and 0.869, respectively. To distinguish between adults with ADHD and controls, the Persian version of the CAARS-S was used, which is a valid and reliable measure [20].

Statistical analysis

SPSS software, version 24 was used for all statistical analyses. The prevalence of ADHD and acne vulgaris were assessed using frequency and percentage, with a 95% confidence interval. The Fisher exact test and chi-squared test are used to compare the frequency of ADHD in two groups. Using the Mean \pm SD, the score of the ADHD evaluation scale was calculated. The ADHD scores of the two groups were compared using the independent t-test. The significance level of all tests was determined to be $P < 0.05$.

Results

The mean age of the participants was 35.12 \pm 13.19 years, and there was no significant difference in the mean age between the case (34.29 \pm 13.60 years) and control (35.94 \pm 12.81 years) groups ($P = 0.418$). Of the participants, 35.9% ($n = 61$) were men, and 64.1% ($n = 109$) were women. The gender difference between the studied groups was not significant ($P = 0.424$) (Table 1). Of the total population, 7.6% ($n = 13$) had ADHD, and the frequency of ADHD in individuals with acne vulgaris compared to control was 8.2% vs 7.1%, respectively, and this difference was not significant ($P = 0.773$). The frequency of ADHD in individuals with acne vulgaris compared with controls was higher in those aged ≤ 30 years and in women. In addition, it was observed that the frequency of ADHD increases with the increase in the severity of acne vulgaris in mild, moderate, and severe forms, which are 5.3%, 10.5%, and 11.1% respectively, although not significant ($P > 0.05$) (Table 2). The mean score of the ADHD questionnaire was 30.21 \pm 17.18 (0 to 78), and no significant differences were found between the case (30.84 \pm 16.99) and control (29.60 \pm 17.45) groups for CAARS scores ($P = 0.641$). The ADHD scales were higher in individuals with acne vulgaris aged ≤ 30 years and in women than in controls. Also, the CAARS score showed an upward trend with increasing severity of acne vulgaris. However, there was no statistically significant difference ($P > 0.05$) between the two groups (Table 3).

Table 1. Characteristics of the case (with acne vulgaris) and control (without acne vulgaris) groups (n=85)

Variables	Mean±SD/No. (%)		P*	
	Case	Control		
Age (y)	34.29±13.60	35.94±12.81	0.418*	
Gender	Male	28(32.9)	33(38.8)	0.424**
	Female	57(67.1)	52(61.2)	

*The independent t-test, **The chi-square test.



Discussion

The growing list of negative consequences linked to adult ADHD emphasizes how critical it is to identify and manage the condition. Still, there are unanswered questions regarding the diagnostic procedure, the true incidence of ADHD in adults, and potential barriers to its identification. The association between ADHD and skin disorders has been a source of public and clinical concern. This condition also applies to acne, which lowers the quality of life for those with it. ADHD detrimentally affects feelings, relationships with others, physical activity, social life, and career standing [21]. Therefore, the

prevalence of ADHD in people with acne vulgaris was examined in this study, along with the impact of gender and age.

In this study, the prevalence of ADHD in all participants was 7.6%, and the prevalence of ADHD in those with and without acne was 8.2% and 7.1%, respectively. A retrospective study of epidemiologically representative samples found that acne vulgaris had a greater than twofold higher likelihood of being linked to ADHD than other skin disorders [7]. Comparing the frequency of ADHD in acne vulgaris and atopic eczema, the odds ratio was 5.606, suggesting a higher prevalence of ADHD

Table 2. Frequency of ADHD in the case (with acne vulgaris) and control (without acne vulgaris) groups

Variables	ADHD	No. (%)		P**	
		Case	Control		
Age (y)	≤30	Yes	4(9.1)	3(7.1)	0.990
		No	40(90.9)	39(92.9)	
	>30	Yes	3(7.3)	3(7.0)	0.990
		No	38(92.7)	40(93.0)	
Gender	Male	Yes	1(3.6)	2(6.1)	0.990
		No	27(96.4)	31(93.9)	
	Female	Yes	6(10.5)	4(7.7)	0.745
		No	51(89.5)	48(92.3)	
Severity of acne vulgaris	Mild		2(5.3)	-	-
	Moderate	Yes	4(10.5)	-	
		No	34(89.5)	-	
	Severe		1(11.1)	-	
	Mild		36(94.7)	-	
Severe	No		34(89.5)	-	
		Yes	8(88.89)	-	

**The chi-square test.



Table 3. The mean score of the ADHD questionnaire in the case (with acne vulgaris) and control (without acne vulgaris) groups

Variables	Case		Control		P*	
	No.	Mean±SD	No.	Mean±SD		
Age (y)	≤30	44	31.39±17.05	42	26.81±17.86	0.228
	>30	41	30.24±17.11	43	32.33±16.80	0.575
Gender	Male	28	26.25±13.77	33	27.27±17.19	0.797
	Female	57	33.09±18.05	52	31.08±17.62	0.558
Severity of acne vulgaris	Mild	38	28.63±14.67	-	-	-
	Moderate	39	31.61±18.05	-	-	-
	Severe	9	36.89±21.45	-	-	-

*The independent t-test.



in patients with acne vulgaris than in those with other skin diseases [22]. Also, in our study, the mean score of CARRS was higher in individuals with acne vulgaris than in control. However, in general, the frequency of ADHD and the ADHD scales did not differ significantly between the two groups, possibly due to the small sample size in the present study. Likewise, Bilgic et al. indicated no statistically significant differences between patients with acne vulgaris and controls regarding ADHD scales [14]. Some studies reported that the increased rate of mental morbidity and suicidal thoughts and actions in acne vulgaris patients may be partially attributed to ADHD [23-25].

Similarly, a study revealed a link between adolescent ADHD and severe acne vulgaris [8]. Nevertheless, in clinical samples, our results did not verify a link between acne vulgaris and ADHD. In addition, it was observed that the prevalence of ADHD and its scores were higher in individuals with severe and mild acne vulgaris, respectively. However, this difference was not statistically significant between individuals with acne vulgaris and control. Similarly, Deveci et al. found no differences between groups in cognitive tests assessing attention or executive function [15]. Gupta et al. demonstrated that patients with acne vulgaris younger than 40 and females have a higher chance of ADHD [7]. Studies suggest that the association with ADHD is unlikely specific to acne vulgaris, as such psychiatric disorders have also been observed in childhood eczema and can occur in any chronic disease [26, 27]. The level of parental androgen is related to autism traits, and multiple genes involved in steroidogenesis are thought to be associated with autism, Asperger's syndrome, and or autistic traits. Higher frequency of androgen-associated disorders, such as acne vulgaris, have been

stated in females with autism spectrum disorders [28]. In our study, the frequency of ADHD and the ADHD scales were higher in individuals with acne vulgaris less than 30 years and women. However, no statistically significant differences have been observed between individuals with and without acne vulgaris. Similar findings have been indicated in the Deveci et al. study [14].

The difference observed in our results compared to other studies may be due to the type of method and validated questionnaire, sampling, ethnicity, and genetic differences in patients with acne vulgaris. The lack of a large sample size is one of our study limitations. Moreover, the information about acne vulgaris duration was unclear among participants. Therefore, it is suggested that research with a broader sample size investigate the comorbidity between acne and ADHD by considering related factors.

Conclusion

In conclusion, the results of the present study did not confirm the association between ADHD and acne vulgaris. Further investigations are necessary to clarify better the links between ADHD and risk factors in individuals with acne vulgaris.

Ethical Considerations

Compliance with ethical guidelines

The study was approved by the Ethics Committee of the [Guilan University of Medical Sciences](#) (Code: IR.GUMS.REC.1400.165). All study procedures complied with the ethical guidelines of the Declaration of Helsinki 2013.

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Authors contributions

Conceptualization, methodology, resources, and supervision: Ali Pourramzani and Kaveh Gharraei Nejad; Investigation, writing the original draft: Sara Fakhraei and Atena Gholipour; Review, and editing: Ali Pourramzani, Kaveh Gharraei Nejad, Sara Fakhraei, and Atena Gholipour; Funding acquisition: Kaveh Gharraei Nejad.

Conflict of interest

The authors declared no competing interests.

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