

Serum Intercellular Adhesion Molecule-1 in Patients with Acne Vulgaris

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Abstract

Background: Acne vulgaris is a prevalent skin condition that affects millions of people throughout the globe. Involvement of adolescents and young adults is common, but older people aren't exempt. Inflammation of the facial and trunk pilosebaceous follicles is the hallmark of this condition. An androgen-induced seborrhea, increased ductal hypercornification and the generation of inflammatory mediators by P. acne and P. granulosum trapped in the cornified plug is related with this condition. CD11a and CD11b/CD18 counter-receptors on the surface of immune cells facilitate their transendothelial migration from the circulatory system to inflammatory sites by interacting with ICAM-1 on endothelial cells. Researchers set out to compare the serum levels of Intercellular adhesion molecule-1 (ICAM-1) in acne sufferers and healthy controls in order to determine the protein's contribution to acne development. A total of 30 individuals with AV were included in this research. In addition, a control group of 30 people of the same age and sex was included. A thorough medical history and clinical examination were conducted on each of the subjects investigated. The dermatology outpatient clinic at Benha University Hospitals was used to select all of the patients. They varied in age from seventeen to twenty-seven years old. The study was authorised by the Benha Faculty of Medicine's ethical committee for research involving human participants. Before any samples were collected or tests performed to determine the blood level of Intercellular adhesion molecule-1 (ICAM -1) at the Clinical Pathology Department of Benha University, informed consent was acquired from each subject. **Results:** There was a statistically significant difference in the levels of sICAM-1 between patients and control groups in this investigation, according to the findings. Patients' sICAM-1 levels were greater than those of the control group which suggests that sICAM-1 may play a role in the disease's development. In teenagers, acne is a common issue and early detection of ICAM-1 levels might aid in the treatment of acne sufferers.

Key words: Serum Intercellular Adhesion Molecule-1, Acne Vulgaris.

1. Introduction:

Acne vulgaris (AV) is a common, long-term skin condition that causes hair follicles and sebaceous glands to become blocked or inflamed [1]. Inflammatory and non-inflammatory lesions may be seen on the skin, or a combination of the two. Face, upper chest, and back are most often affected, although other parts of the body may also be affected [2]

In adolescence, the prevalence of acne vulgaris may reach as high as 80 percent. Adult acne is less prevalent than teenage acne, yet it is nonetheless common. Some 3 percent to 6 percent of adult males and 5% to 12% of adult women are affected by this issue, albeit not as much as previously thought. As the most prevalent skin condition, acne vulgaris may cause substantial psychological issues such as anxiety and sadness in people who suffer from it [3].

AV's etiopathogenesis is influenced by a wide range of variables. Increased sebum production and aberrant keratinization are two of the most important contributing causes. Inflammation is another. Inflammation has lately been proposed as the first component in this chain of events, although the exact chronology is yet unknown. It is not yet clear how Propionibacterium acnes (P.C.) is involved in the initiation and maintenance of the inflammatory response [4].

Inflammatory reactions occur prior to hyperkeratinization, according to the research. Cell adhesion molecule-1 (ICAM-1), human leukocyte antigen (HLA)-DR, and other inflammatory mediators are all regulated

by macrophages and cytokines in the arteries surrounding the pilosebaceous follicle [5]

Transmembrane glycoprotein of the immunoglobulin superfamily, intercellular adhesion molecule 1 (ICAM1) is present at baseline levels in a range of cell types and is increased in response to certain inflammatory mediators (also known as CD54). The 2 integrin counter-receptors CD11a/CD18 and CD11b/CD18 on the surface of immune cells interact with ICAM1 produced on endothelial cells during inflammation, allowing immune cell transendothelial migration from the circulation to the inflammation site [6]

Epithelial ICAM1 expression may contribute to epithelial injury by recruiting inflammatory cells to the lesional area [7].

Researchers set out to compare the serum levels of Intercellular adhesion molecule-1 (ICAM-1) in acne sufferers and healthy controls in order to determine the protein's contribution to acne development.

2. Patients and Methods

The Type of Research

Case-control research is what this study is.

2.1. Research Population:

This research included 30 AV patients (Group A) and a control group of 30 people who seemed to be healthy and were the same age and gender as the AV patients (Group B). Dermatology and Andrology patients from

Benha University Hospitals' outpatient clinic were recruited between [January and March 2020].

Considerations of Administrative Design and Ethical Principles.

The research was given the go light by the Benha Faculty of Medicine's local ethics committee. Before any samples were collected, the informed permission of each subject was acquired.

Acne is a common skin condition that affects both sexes equally. Male and female patients suffer from acne vulgaris are included.

Anti-acne treatment in the month preceding to the research is an automatic no-go. The trial will exclude participants with acne fulminans and acne conglobata.

2.2. Methods

The following procedures were performed on each patient.

1. The whole history

A person's personal history includes the following information: a person's name, age, sex, profession, residence, unique medical habits, and their marital status.

Family history of AV and post-acne scarring. Present history: AV onset, course, length, relation to nutrition, stress, relation to sun exposure, past treatment, as well as history of other skin disorders.

The patient's past medical history, such as the types, dosages, and durations of any prescription drugs, hormonal contraceptives, or autoimmune illnesses, should also be considered.

2. A physical examination is required.

3. Results

Table (1) Comparison of demographic data and anthropometric measures between AV patients and control groups.

		Control N=30		AV N=30		<i>p</i>
Age (years)	mean±SD	22	±4.4	21.9	±4.6	
Males	N, %	14	46.7%	13	43.3%	0.795
Females	N, %	16	53.3%	17	56.7%	
BMI (kg/m²)	mean±SD	22.6	±1.6	22.6	±1.6	0.938

SD, standard deviation; student t test was used for numerical parameters; Chi square test was used for categorical parameters.

The AV group mean age was 21.9 years, they were 13 males (43.3%) and 17 females (56.7%). In addition to 30 healthy control group, their mean age was 22 years, they were 14 males (46.7%) and 16 females (53.3%). Cases and control groups had matched age and gender ($p>0.05$ for each).

BMI did not differ significantly between both groups ($p>0.05$).

Table (2) Comparison of risk factors between AV patients and control groups.

	Control N=30		AV N=30		<i>p</i>
	N	%	N	%	
Smoking	5	16.7%	4	13.3%	0.718
Family history	9	30.0%	18	60%	0.020
Relation to sun exposure	2	6.7%	9	30%	0.022
Relation to diet	10	33.3%	18	60%	0.036
Relation to stress	2	6.7%	8	26.7%	0.038

Chi square and Fisher exact tests were used for comparison.

AV were associated significantly with family history, sun exposure, hyperglycemic diet, stress when compared to control group ($p=0.020, 0.022, 0.036, 0.038$ respectively).

No significant difference was found regarding smoking between cases and control groups ($p>0.05$ for each).

Systemic disorders such as thyroid disease, diabetes mellitus, and other autoimmune diseases should be ruled out by a comprehensive general examination.

It is important to do a thorough dermatological examination to determine the clinical variation, severity of AV, and existence of acne scarring.

Patients with non-inflammatory lesions, such as closed (whiteheads) and open (blackheads) comedones, and inflammatory lesions, including papules, pustules, nodules, and cysts on the face, chest, and upper back, were diagnosed with AV based on their medical history and characteristic clinical findings.

2.3. Laboratory investigations:

All studied subjects were tested for:

Serum level of Human intercellular adhesion molecule 1

Procedure:

Five milliliters of venous blood sample was collected from every participant in the study under complete aseptic precautions in the plain test tubes without anticoagulant. After coagulation, samples were centrifuged (at 1500 g for 15 min). The separated serum was aliquoted and stored at -20°C for subsequent assay of serum ICAM-1.

Statistical analysis

The collected data was revised, coded, tabulated and introduced to a PC using Statistical package for Social Science (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Data were presented and suitable analysis was done according to the type of data obtained for each parameter.

Table (3) Clinical features in all studied AV cases.

		AV N=30	
Disease duration (years)	mean±SE	2.5	±0.3
Onset	Sudden	N, %	16 53.3%
	Gradual	N, %	14 46.7%
Course	Stationary	N, %	17 56.7%
	Progressive	N, %	13 43.3%
Site	Face	N, %	30 100%
	Back	N, %	8 26.7%
Grading	Mild	N, %	9 30%
	Moderate	N, %	13 43.3%
	severe	N, %	8 26.7%
Scar formation		N, %	16 53.3%
History of treatment	Present	N, %	26 86.7%
	Topical	N, %	26/26 100%
	Systemic	N, %	14/26 53.8%
History of systemic diseases		N, %	0 0%

SD, standard error.

Mean disease duration was 2.5 years. Disease onset was sudden in 53.3%, gradual in 46.7%, disease course was stationary in 56.7%, progressive in 43.3%.

Face was affected in all cases, while back was affected in 26.7%.

Grades were assessed in all studied cases, 30% had mild grade, 43.3% had moderate and 26.7% had severe grade.

Scar was formed in 53.3% of all studied cases.

Most of cases received previous treatment (86.7%). All of them received topical treatment, while 53.8% had systemic therapy.

Table (4) Comparison of ICAM-1 level between all studied groups.

		Control N=20	AV N=30	<i>p</i>
ICAM-1 (ng/mL)	mean±SE	204.6±8.9	750.1±120.9	<0.001
	Minimum-maximum	118.4-289.1	263.5-2345.2	

SD, standard error; Mann Whitney test was used for comparison.

AV group showed significantly higher ICAM-1 when compared to control group (mean=750.1 versus 204.6, $p < 0.001$).

4. Discussion

Results Patients with AV were found to be between the ages of 18 and 28 at the time of the current investigation. AV is a frequent condition between adolescence and adulthood since both males and females endure hormonal changes during this time period. Both men and women's androgen levels rise, resulting in enlarged sebaceous glands that secrete more sebum. Acne is caused by an increase in sebum production, which clogs the pores [8].

There is a discrepancy between the present study's findings and the findings of Lu et al. [9] in which it was found that the mean BMI of acne patients was significantly higher than that of the control population. Those with moderate to severe acne had a significantly higher BMI compared to those in the control group. Due to the use of groups with similar demographics (age, gender, and BMI) in this research, the discrepancy between the two studies' results may be explained.

Patients' clinical data revealed that 53.3% of patients had a fast beginning of illness, 46.7% had a gradual onset of disease, 56.7% had a stationary course of disease, and 43.3% had a progressive course of disease,

with a duration ranging from 6 months to 12 years. With a median illness duration of 2.5 years, the results from Dawson and Dellavalle [2] support the idea that AV is an ongoing condition.

Patients with AV had worsened lesions after being exposed to the sun ($p=0.022$), according to the findings of this research. According to these findings, psoralens and ultraviolet-A (PUVA) treatment may cause or worsen AV, which is in line with previous research by Kubba et al. [10]

According to the findings of this research, a correlation between psychological stress and acne was found ($p=0.038$). Those findings are in line with those of the study conducted by Uhlenhake, et al. [11], who found a direct correlation between anxiety and acne severity, and the study conducted by Khunger and Kumar, [12], who found that chronic stress is a cause of increased androgen secretion, an increase in sebum production, and a decrease in the immune system.

Acne was found to be more common in first-degree relatives and twins in this study (60 percent), which is in accordance with previous research by Barnes et al. [13].

Acne predisposition is more common in twins and first-degree relatives, the researchers concluded.

Face was impacted in all instances, whereas the back was damaged in 26.7% of the patients examined in this research. The face, upper chest, neck, and arms were all affected by AV, according to Adityan and Thappa's study (14); they also found that all patients had facial involvement, while the back, chest, neck, and arms were all affected by AV. Harper and Fulton's study [15] found that AV mostly affects the areas of skin with the highest proportion of sebaceous follicles.

Acne scarring was seen in 53.3% of the patients examined in this research. a research by Layton et al. [16] found that up to 95% of patients with active acne had some degree of facial scarring.

According to the findings of this research, there was no significant difference in smoking rates between the case and control groups. Heng et al. [17] found that the influence of smoking status on the severity of acne is ambiguous, and these findings are consistent with their findings. In contrast, a research done by Karada et al. [18] showed a higher incidence of severe acne among smokers.

Acne was found to be associated with an increased intake of sweets, chocolate, and oily foods in a cross-sectional study involving 1002 participants. The results showed that AV were significantly associated with a hyperglycemic diet ($p=0.036$); this finding matched that of a previous study conducted by Ghodsi et al. An acne-inducing low glycemic load diet has been shown to increase insulin sensitivity and alter the composition of surface triglycerides in two controlled studies conducted in 2007.

Serum ICAM-1 levels were found to be greater in AV patients than in controls, according to the present study's findings which coincide with a research by Jeremy et al. [5] reported that (ICAM-1) expression seemed to rise in uninvolved skin but not statistically significant, whereas a substantial increase was detected in papules of less than six hours

5. Conclusion

ICAM-1 serum level was significantly higher among AV patients. Adolescent acne sufferers may benefit from earlier detection of elevated serum level of ICAM-1.

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