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Investigation of the relationship between clinical severity of acne and inflammatory parameters in patients with acne vulgaris

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Abstract

Objective In this study, we investigated whether the Neutrophil /Lymphosite (N/L) ratio, mean platelet volume (MPV) value, GADS (The global acne rating system) score and other inflammatory parameters are related in acne vulgaris patients. Methods One-hundred acne patients, aged between 18–40 years, who treated at the Karaman Training and Research Hospital Dermatology Polyclinic between January and March 2022 were included in the study. Age, sex, duration of disease, medications and additional systemic diseases were recorded. Acne patients included in the study were tested for N/L ratio, erythrocyte sedimentation rate (ESR, mm/hr), C-reactive protein (hsCRP, mg/L), platelet count (PLT/L) and (MPV/FL). GADS scores calculated. Results There was a significant difference in ESR ($p < 0.001$) and CRP levels ($p = 0.002$) in patients with high GADS scores compared to those with low GADS scores. In all patients, the mean GADS score was 24.77 ± 11.00, and GADS scores were positively correlated with ESR and CRP levels. In our binary logistic regression analysis of age, sex, time, N/L ratio, PLT/L, MPV and ESR for identifying risk factors for severe acne vulgaris, the model explained 25.7% of high GADS scores. A high CRP level was identified as a risk factor for having a high GADS score. Conclusion In our study, we evaluated acne patients because it affects many age groups, is common, and sometimes causes extensive inflammation.

Keywords: acne severity, inflammatory parameters, inflammatory diseases, acne vulgaris

1. Introduction

Acne vulgaris is a chronic inflammatory condition involving the pilosebaceous unit. It is frequently encountered in dermatology practice and affects 80% of the population at some point in their lives (1). While 60% of acne cases regress with short-term and local treatments, acne in the remaining 40% may persist into adulthood (2). Inflammatory indicators, such as the Neutrophil/Lymphosite (N/L) ratio, are associated with disease activity and prognosis in many dermatological diseases (3-5). Mean platelet volume (MPV) is a marker of routine complete blood count, and it is a frequently used value to determine platelet function and activation (6,7). Recent studies have stated that MPV can be used as an indicator of inflammation in different inflammatory conditions (8-10). The global acne rating system (GAGS) is used to determine the clinical severity of acne. In this study, we investigated whether the N/L ratio, MPV value, GAGS score and other inflammatory parameters are related in acne vulgaris patients.

2. Material and Methods

One-hundred acne patients, aged between 18–40 years, who were treated at the Karaman Training and Research Hospital Dermatology Polyclinic between January and March 2022 were included in the study. The exclusion criteria were pregnancy, lactation, kidney or liver dysfunction, the use of medication to treat such conditions, a history of systemic inflammatory disease, and/or systemic immunosuppressive treatment within the prior month.Informed consent was obtained from all patients prior to their inclusion in the study. Age, gender, duration of disease, medications and additional systemic diseases were recorded. Patient identification information was kept confidential. Ethical approval was obtained from the Non-Interventional Research Ethics Committee of Fırat University Rectorate (approval dated 05.01.2022, numbered 130133).

2.1. Lab tests

Acne patients included in the study were tested for N/L ratio, erythrocyte sedimentation rate (ESR, mm/hr), C-reactive protein (hsCRP, mg/L), platelet count (PLT/L) and mean platelet volume (MPV/FL) after 8 hrs of fasting. Serum hsCRP levels were determined using immunoturbidimetry.

2.2. Global Acne Assessment

In this scoring system, the upper parts of the face, chest, and back are divided into six parts. In addition, a coefficient for each region (chest and upper back = 3; forehead, right and left cheek = 2; nose and chin = 1) is assigned, which considers the region's width as well as the density and distribution of pilosebaceous units. Acne lesions are also graded between 0–4

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according to their type (no lesion = 0, ≥ 1 comedone = 1, ≥ 1 papule = 2, ≥ 1 pustule = 3, ≥ 1 nodule = 4). Each region is evaluated separately, and a score is determined for each region by multiplying the score according to the most severe lesion type in that region and the coefficient of that region; the global acne score is calculated as the sum of the scores of the six regions. Total scores range from 0 to 44, and acne severity is determined according to the GAGS score (0 points = no acne, 1–18 points = mild acne, 19–30 points = moderate acne, 31–38 points = severe acne, > 39 points = very severe acne) (11). In our study, patients with a GAGS score below 30 were classified as having mild to moderate acne, and those with a GAGS score above 30 were classified as having severe acne.

2.3. Statistical Analysis

Data analyses were performed with the SPSS Statistical Package, version 22.0 (IBM, Armonk, NY). For categorical data, the chi-square test was used, and data were summarised as frequency and percentage for each category. Numerical data were evaluated for normal distribution using the Kolmogorov-Smirnov test, and it was found that the data were not normally distributed. Therefore, the Mann-Whitney U test and Spearman's rank correlation coefficient were used. Binary logistic regression was used to determine the effective factors in determining the GAGS score. A p-value ≤ 0.05 was considered statistically significant.

3. Results

Of the 100 acne patients, 60 were women and 40 were men; mean age was 24.37 ± 7.74 years. In the mild to moderate GAGS group, 63.5% of the 33 patients were female, and the mean age of this group was 24.29 ± 8.05 years (Table 1).

Table 1. Age, gender, and time distributions of acne patients with low to high GAGS scores

		GAGS low	GAGS high	Total	p
Sex	Female	%63.5 (33)	%56.3 (27)	%60.0 (60)	0.462[a]
	Male	%36.5 (19)	%43.7 (21)	%40.0 (40)	
Age		24.29±8.05	24.46±7.47	24.37±7.74	0.777[b]
Time (year)		3.96±2.76	4.02±2.48	3.99±2.61	0.673[b]

[a]ChiSquare, [b]Mann Whitney U

Table 2. Comparison of laboratory data of patients with low and high GAGS values

	GAGS low	GAGS high	All patients	p
N/L	1.86±.67	2.036±0.79	1.94±0.73	0.315[b]
PLT/L	114.94±29.76	125.15±36.67	119.84±33.48	0.164[b]
MPV	9.22±.88	9.404±0.87	9.31±0.88	0.479[b]
ESR	7.27±12.07	10.71±7.86	8.92±10.36	**<0.001[b]**
CRP	2.40±3.05	7.371±7.51	4.788±6.15	**0.002[b]**

[a]ChiSquare, [b]Mann Whitney U

There was a significant difference in ESR ($p < 0.001$) and CRP levels ($p = 0.002$) in patients with high GAGS scores compared to those with low GAGS scores (Table 2). In all patients, the mean GAGS score was 24.77 ± 11.00, and GAGS scores were positively correlated with ESR and CRP levels (Table 3).

Table 3. Correlations between GAGS Score and Other Variables in Acne Vulgaris Patients

		Age	Time	GAGS	N/L	PLT/L	MPV	ESR	hsCRP
Age	r	1							
	p								
Time	r	.580**	1						
	p	<.001							
GAGS	r	-.018	.036	1					
	p	.855	.725						
N/L	r	-.097	-.036	.110	1				
	p	.337	.722	.275					
PLT/L	r	.013	.022	.151	**.555****	1			
	p	.897	.825	.135	**.000**				
MPV	r	-.108	.119	.191	.077	-.159	1		
	p	.283	.238	.057	.446	.113			
ESR	r	.028	.115	**.364****	**.316****	**.327****	.056	1	
	p	.779	.256	**.000**	**.001**	**.001**	.582		
CRP	r	.184	**.208***	**.276****	**.212***	.186	-.034	**.538****	1
	p	.067	**.038**	**.005**	**.035**	.063	.735	**<.001**	

r= correlation coefficient * $p \leq 0.05$ (2-tailed), ** $p \leq 0.01$ (2-tailed)

In our binary logistic regression analysis of age, sex, time, N/L ratio, PLT/L, MPV and ESR for identifying risk factors for severe acne vulgaris, the model explained 25.7% of high GAGS scores (Nagelkerke R squared = 0.257; Omnibus Tests of Model Coefficients, $p = 0.006$; Hosmer and Lemeshow test, $p = 0.446$). A high CRP level was identified as a risk factor for having a high GAGS score (Table 4).

Table 4. Risk factors for high GAGS scores.

	B	p	OR	95% CI for OR	
				Lower	Upper
Age	0.004	0.914	1.004	0.934	1.079
Sex (ref=Female)	0.280	0.564	1.323	0.510	3.431
Time (year)	-0.030	0.763	0.970	0.796	1.182
N/L	0.120	0.767	0.887	0.402	1.958
PLT/L	0.005	0.569	1.005	0.988	1.023
MPV	0.370	0.174	1.448	0.849	2.470
ESR	-0.012	0.659	0.988	0.938	1.042
hsCRP	0.188	**0.001**	1.207	1.078	1.352

4. Discussion

The main organ targeted in acne is the pilosebaceous follicle. Pathophysiological factors that play a role in acne formation include increased sebum production, abnormal follicular desquamation, Propionibacterium acnes colonisation and inflammation. Until recently, abnormalities in follicular desquamation responsible for the formation of microcomedones and hyperseborrhea were considered to be the most important of these factors. However, studies conducted in recent years have focused on the role of sebaceous lipids and inflammatory mediators, and it has been shown that immune changes and inflammatory responses occur in the early period before ductal hyperproliferation develops (2,12,13). Of the 100 acne patients included in our study, 60 were female and 40 were male. The mean age of the patients was 24.37 ± 7.74 years, and the mean ages of the mild to moderate and severe acne groups were comparable. These values are similar to those reported in the literature (14). hsCRP and ESR values are frequently used markers in the evaluation of acute phase response, due to their reliability and cost-effectiveness (15,16). In our study, the ESH and hsCRP values of patients with high GAGS scores were found to be significantly higher than those with low GAGS scores. Similar to our study, Namazi et al (17) compared a mild to moderate acne group with a severe acne group, and the mean hsCRP values were found to be significantly higher in the severe group (3.006 and 1.217 mg/l, respectively). It has been previously stated that hsCRP is a practical indicator used to evaluate the severity of cutaneous inflammation in acne (17). Some prospective epidemiological studies have indicated that, in addition to hsCRP being an inflammatory marker, high hsCRP levels are a strong indicator of cardiovascular risks (18,19). Since the skin is the largest organ in the body, inflammatory dermatological conditions have the potential to trigger systemic inflammation. MPV is studied as a part of routine complete blood count testing and is a common marker used to show platelet function and activation. In recent years, it has been reported that MPV can also be used as an inflammatory marker in different diseases (6,7). Different studies have reported that MPV has either a positive or negative correlation with inflammatory activity (8,9). In addition, there are studies investigating the effects of inflammatory diseases on haematopoiesis, and these effects are clinically observed most often in cases of anaemia and thrombocytosis. Anaemia and severe thrombocytosis have been found to be associated with some inflammatory diseases, and it has been shown that thrombocytosis may occur through proinflammatory cytokines and some growth factors (20-23).Neutrophils are activated by enzymes such as myeloperoxidase, elastase, and acid phosphatase. Circulating leukocyte rates vary based on inflammatory reaction states. Relative to neutrophilia, lymphopenia may occur. In the literature, it has been revealed that the N/L ratio is a prognostic marker in many important conditions such as cardiovascular diseases, diabetes mellitus, hypertension, and cancer (24). The PLT/L ratio is a parameter that can show inflammation more sensitively than the N/L ratio. Thrombocytosis is considered to be a negative prognostic factor in some cancer cases. An increased platelet count or an increase in the ratio of platelets to lymphocytes can be explained by the inflammatory process caused by neoplastic cells (25,26). Topal et al (26) stated that the number of lymphocytes may decrease with age. In the same study, it was emphasised that the use of the PLT/L ratio as a marker for inflammation varied between age groups. In our study, the MPV, N/L and PLT/L ratios of patients with mild to moderate acne and those with severe acne did not differ. We believe that this may be related to the low mean age of our patient group and the duration of disease. Acne is a condition that can continue long into adulthood, and it can become chronic and cause systemic inflammation (27,28). In our study, we evaluated acne patients because acne affects all age groups, is common, and sometimes causes intense inflammation.To evaluate the relationship between acne severity and inflammation, future studies with larger sample populations are needed.

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Ethical Statement

Ethical approval was obtained from the Non-Interventional Research Ethics Committee of Fırat University Rectorate (approval dated 05.01.2022, numbered 130133).

Conflict of interest

The authors declared no conflict of interest.

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None to declare.

Authors' contributions

Concept: K.T.K., H.M.A., Design: K.T.K., Data Collection or Processing: K.T.K., H.M.A., Analysis or Interpretation: K.T.K., H.M.A., Literature Search: K.T.K., H.M.A., Writing: K.T.K., H.M.A.

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