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Evaluation of neutrophil-to-lymphocyte ratio and platelet-to-lymphocyte ratio in Turkish patients with chronic plaque psoriasis

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Abstract

Introduction: This study evaluates the relationship between disease activity and neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) in patients with chronic plaque psoriasis.
Methods: Clinical and biochemical data were retrieved through retrospective examination of patients' and healthy subjects' medical records. NLR and PLR values were calculated from the hemogram results. This study included 46 patients (25 males, 21 females; 36.58 ± 9.82 years) diagnosed with chronic plaque psoriasis and a control group of 46 healthy volunteers (21 males, 25 females; 34.02 ± 8.41 years).
Results: NLR and PLR were significantly elevated in patients with chronic plaque psoriasis ($p = 0.0001$ and $p = 0.003$, respectively). PASI was positively correlated with NLR, PLR, and serum CRP levels ($r = 0.313$, $p = 0.034$; $r = 0.394$, $p = 0.017$; $r = 0.359$, $p = 0.014$, respectively).
Conclusion: NLR and PLR are low-cost tests that can be used to determine the severity of current systemic inflammation in patients with chronic plaque psoriasis.

Keywords: psoriasis, neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, systemic inflammation, low-cost test

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Introduction

Psoriasis is an immune-mediated, chronic, and systemic disease characterized by increased proliferation of the epidermis (1–3). The prevalence of psoriasis among the general population is 2 to 3%. Although the skin is the most obvious source of inflammation in psoriasis, it is now widely recognized that psoriasis is a systemic disease frequently associated with significant comorbidities (4, 5).

Determining disease severity is important in psoriasis for administering convenient, safe, and effective treatment. However, evaluation of psoriasis severity is complicated and, unfortunately, there is no single tool that can assess every aspect of the disease (6). One of the most commonly used scales in identifying psoriasis severity is the Psoriasis Area Severity Index (PASI), which has been used since 1978 and includes symptoms such as erythema, desquamation (scaling), and induration/infiltration according to anatomic localization (7). Body surface area (BSA) distribution percentage is a simple scale that can be used in cases in which PASI cannot be conducted (7). However, PASI and BSA are limited due to the high degree of variation between clinicians, a lack of objective evaluation criteria, and insufficient evaluation of chronic microvascular inflammatory conditions underlying the disease. Disease activity has been evaluated in patients with psoriasis by measuring cytokines, adhesion molecules, and parameters used in routine blood tests such as CRP (8–12). Parameters for evaluating systemic inflammation are necessary in patients with systemic and chronic psoriasis.

The ratio of neutrophils to lymphocytes (NLR) and the ratio of platelets to lymphocytes (PLR) are simple markers of the systemic inflammatory response that can be easily measured as part of a detailed complete blood count, which is commonly used in the setting of chronic inflammatory disease (8, 13). Previous studies investigated the use of NLR and PLR in diabetes mellitus, acute coronary syndrome, ulcerative colitis, end-stage renal disease, tuberculosis, rheumatoid arthritis, cirrhosis, and systemic inflammation in familial Mediterranean fever. In addition, there have been studies proposing that NLR and PLR can be used to determine prognoses in cancer patients (13–20). Few studies have evaluated NLR and PLR in psoriasis patients (16–18).

This study investigates systemic inflammation using the hemogram parameters NLR and PLR in psoriasis patients and healthy controls, and examines the relationship between these hemogram parameters and PASI, an established measure of disease severity in psoriasis.

Methods

This study included 46 patients presenting at our clinic that were diagnosed with chronic type psoriasis and 46 healthy subjects matched with the patient group by age and sex. Ethical consent (approval number: 2014/101-190) was granted by the Clinical Research Ethics Committee. The study subjects were between 20 and 60 years old. Patients that had not undergone systemic treatment for psoriasis during the previous 3 months were included in the study. Patients with malignant tumors, those diagnosed with psoriatic arthritis or any other systemic inflammatory disease, or those using medication were excluded from the study. Patient data were obtained retrospectively using the Hospital Information Management System and the integrated Laboratory Information Management System with KarMeD software at the dermatology clinic and biochemistry laboratory. Age, sex, disease duration, family history of psoriasis, body mass index (BMI; body weight in kilograms is divided by the square of height in meters), PASI

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values, and previous treatments for each patient were recorded in the patient data forms.

Standard procedures for the complete blood count are described below.

The complete blood count was measured using a Mindray BC-6800 hematology analyzer (Mindray Bio-Medical Electronics Co., Ltd., Shenzhen, China). Venous blood samples were taken in a sitting position. A gel separator dry tube containing 10 ml clot activator and vacuum tubes containing 2 ml K2EDTA were used to collect serum and whole blood. Blood samples were centrifuged at 1250 × g for 15 minutes after standing for 30 minutes. Tests for both serum and blood samples were completed within 4 hours.

Leukocytes, erythrocytes, platelets, hemoglobin, mean corpuscular volume (MCV), and mean platelet volume (MPV) were determined in the hemogram tests. NLR was calculated as the neutrophil count divided by the lymphocyte count. PLR was calculated as the platelet count divided by the lymphocyte count. NLR < 2 was considered low risk, 2–5 moderate risk, and > 5 high risk (14, 20). Although cutoff PLR values of 190–244 have been used in previous studies, the precise PLR cutoff has not been well defined (20, 21).

Serum glucose, triglycerides, total cholesterol, and HDL cholesterol were measured using Abbott Commercial Kits. The CRP level was measured using the Archem Diagnostics Commercial Kit with an Abbott C8000 Architect (Abbott Laboratories, Abbott Park, IL, ABD) biochemistry autoanalyzer.

Continuous variables are expressed as mean ± standard deviation. Categorical variables are expressed as percentages. The distribution of numerical data was assessed using the Kolmogorov–Smirnov test for normality. In the analysis of normally distributed variables, Student's t-test was applied to examine the differences between two groups. The differences between two independent groups were examined using the non-parametric Mann–Whitney U test for non-normally distributed variables. Pearson correlation was used in the correlation analysis for normally distributed variables, and the Spearman correlation analysis was used for non-normally distributed variables. The significance level was set at $\alpha = 0.05$ for all tests and $p < 0.05$ was considered statistically significant evidence in favor of rejecting the null hypothesis.

Results

A total of 46 patients diagnosed with psoriasis (25 males, 21 females; mean age: 36.58 ± 9.82 years old; range: 20–53 years) and 46 healthy control subjects (21 males, 25 females; mean age: 34.02 ± 8.41 years old; range 20–59 years) were included in this study. The severity of disease was determined using the PASI values, which ranged from 1 to 45 in the psoriasis patients. The mean PASI was 9.08 ± 8.78. The mean disease duration was 158.56 ± 98.90 months among the psoriasis patients. There was a family history of psoriasis in 4% ($n = 2$, 1 female, 1 male) of 46 patients.

Additional demographic data, BMI values, and clinical biochemistry data are presented for both groups in Table 1. There was a statistically significant difference in CRP levels between the patient and control groups ($p = 0.0001$).

Complete blood count data, leukocyte subgroup distribution ratios, and NLR and PLR results are presented in Table 2. There was a statistically significant difference in terms of leukocyte, platelet, neutrophil, NLR, and PLR between the patient and control groups ($p = 0.003$, $p = 0.029$, $p = 0.0001$, $p = 0.0001$, $p = 0.003$, respectively). PASI score was positively correlated with PLR ($r = 0.394$, $p = 0.007$), NLR ($r = 0.313$, p = 0.034), CRP ($r = 0.359$, $p = 0.014$), and disease duration ($r = 0.367$, $p = 0.012$) in the Spearman correlation analysis. On the other hand, PASI was negatively correlated with lymphocyte counts ($r = -0.349$, $p = 0.017$). There was no relationship between PASI and the other parameters evaluated ($p > 0.05$). Scatter plots demonstrating the relationship between PASI score and NLR, PLR, and CRP are seen in Fig. 1.

Table 1 | Demographic data and biochemical results in the patient and control groups.

	Psoriasis (n = 46)	Control (n = 46)	*p*
Age (years)	36.58 + 9.82	34.02 + 8.41	0.182
Sex (F/M)	21/25	25/21	0.407
BMI	23.04 ± 1.93	22.83 ± 2.06	0.466
Blood glucose (mg/dl)	87.86 ± 6.93	88.89 ± 8.09	0.530
Total cholesterol (mg/dl)	170.28 ± 3.94	178.61 ± 26.53	0.243
HDL cholesterol (mg/dl)	43.97 ± 9.39	45.29 ± 10.48	0.536
VLDL cholesterol (mg/dl)	21.84 ± 7.98	19.47 ± 9.05	0.195
LDL cholesterol (mg/dl)	104.54 ± 31.49	113.83 ± 20.82	0.110
CRP (mg/l)	2.41 ± 1.84	0.92 ± 0.55	**0.0001**

F = female, M = male, BMI = body mass index, HDL = high density lipoprotein, LDL = low density lipoprotein, VLDL = very low density lipoprotein, CRP = C-reactive protein.

Table 2 | Complete blood count data (leukocytes, erythrocytes, platelets, hemoglobin, MCV, MPV, and distribution ratios of leukocyte subgroups) and NLR, PLR values from the patient and control groups.

	Psoriasis (n = 46) Mean ± SD	Control (n = 46) Mean ± SD	*p*
Leukocyte (10^9/l)	7.52 ± 2.08	6.37 ± 1.47	**0.003**
Erythrocyte (10^9/µl)	5.02 ± 0.51	4.87 ± 0.39	0.344
Platelet (10^6/µl)	296.82 ± 83.19	264.00 ± 55.82	**0.029**
Hemoglobin (g/dl)	14.51 ± 1.69	14.25 ± 1.65	0.460
MCV (fl)	85.33 ± 4.69	85.80 ± 5.78	0.670
MPV (fl)	9.43 ± 1.13	9.60 ± 1.03	0.456
Neutrophil (10^9/l)	5.03 ± 2.22	3.65 ± 1.08	**0.0001**
Lymphocyte (10^6/µl)	2.02 ± 0.51	2.21 ± 0.52	0.083
NLR	2.78 ± 1.74	1.75 ± 0.55	**0.0001**
PLR	159.18 ± 64.22	125.01 ± 38.14	**0.003**

MCV = mean corpuscular volume, MPV = mean platelet volume, NLR = neutrophil-to-lymphocyte ratio, PLR = platelet-to-lymphocyte ratio, SD = standard deviation.

Discussion

There is currently no universal laboratory marker of disease activity in psoriasis. Previous studies have investigated adhesion molecules and cytokines as potential markers of disease activity in psoriasis; both methods require experienced laboratory staff and additional costs (6). Hence, there remains a need for reliable and practical markers of systemic inflammation in psoriasis. NLR and PLR, which can easily be calculated from the neutrophil, platelet, and lymphocyte counts and which are routine low-cost tests, are important markers of systemic inflammation (19).

Our data demonstrate that NLR, PLR, and CRP increase in patients with psoriasis. In addition, NLR, PLR, and CRP levels are correlated with PASI, a widely used index of disease severity.

A small number of studies have previously examined NLR and PLR in patients with psoriasis (16–18). Yurtdaş et al. evaluated the correlation between NLR and subclinical atherosclerosis in 51 psoriasis patients and 37 healthy volunteer controls. They reported no statistically significant difference between patient and control groups in terms of leukocyte, neutrophil, and lymphocyte counts, and PLR values (16). Similar to this study, Yurtdaş et al. reported a significant increase in NLR among patients relative to control subjects ($p = 0.005$) and demonstrated a positive correla-

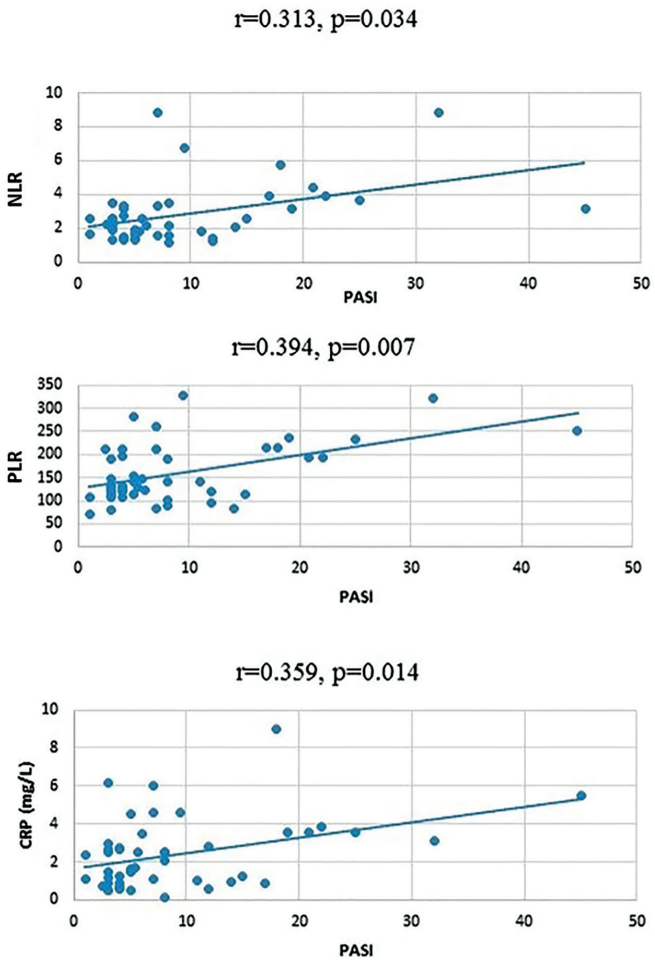

Figure 1 | Scatter plots of PASI (Psoriasis Area Severity Index) with NLR (neutrophil-to-lymphocyte ratio), PLR (platelet-to-lymphocyte ratio), and CRP (C-reactive protein) values in psoriasis patients.

tion between PASI and NLR (r = 0.4423, p = 0.002). Ataseven et al. reported a statistically significant increase in leukocyte, neutrophil, and NLR values among patients ($p < 0.05$, $p < 0.01$, $p < 0.01$, respectively), but detected no relationship between PASI and NLR values in their study comparing 104 psoriasis patients with 70 healthy controls (17). The mean PASI value was higher in our study than the mean PASI values reported in the study by Ataseven et al. This higher mean PASI value, which shows the severity of psoriasis, indicates more systemic inflammation in our patients. In contrast to Ataseven et al. and to confirm this, we identified not only a high level of NLR but also a high level of PLR in our study. In addition, Ataseven et al. did not evaluate CRP and PLR in their study (17). PLR increased significantly among psoriasis patients and was correlated with PASI in this study. Kim et al. assessed NLR and PLR in Korean psoriasis patients with or without psoriatic arthritis. They reported that elevated NLR and PLR were significantly associated with psoriasis and psoriatic arthritis. Both NLR and PLR were strong predictors for the presence of psoriatic arthritis among psoriasis patients (18).

Beygi et al. reported that elevated CRP levels were reported in 24 of 28 studies conducted on patients with psoriasis. A total of 15 of the 28 studies reviewed reported no relationship between CRP and disease activity (11). As a result, CRP, another marker of systemic inflammation, was included in this study in addition to NLR and PLR.

Psoriasis is widely viewed as a systemic inflammatory disease with important comorbidities such as metabolic syndrome, obesity, and cardiovascular diseases (4, 5). In recent years, studies investigating comorbidities have focused on chronic inflammation in psoriasis. Chronic systemic inflammation may play an important role in metabolic and vascular disorders (2). PASI is an index evaluating clinical skin findings and does not reflect the chronic microvascular inflammatory condition. NLR and PLR, which can easily be obtained from routine hemogram tests, are cheap markers of systemic inflammation. We propose that these laboratory markers of ongoing inflammation can be used in psoriasis patients in addition to PASI.

The current study has some limitations. This was a retrospective study with a small number of patients. Not all variable confounding factors could be included in the statistical analysis, and there is an absence of follow-up results for patients with mild disease.

In conclusion, NLR and PLR are elevated in patients with psoriasis and are correlated with the PASI disease activity index. These parameters can be used in continuous monitoring of disease activity. NLR and PLR may be important parameters in the follow-up of patients with psoriasis. The use of these parameters to monitor systemic inflammation may help reduce the prevalence of comorbidities in psoriasis patients.

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