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Original Article

Systemic Immune-Inflammation Index as a Biomarker of Psoriasis Severity

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ABSTRACT

Objective: The aim of this study was to investigate the systemic immune-inflammation index as a biomarker of psoriasis skin disease severity and to evaluate its possible relation with psoriasis clinical types.

Methods: Patients with psoriasis and healthy controls were included in this study. Demographic features, disease duration, psoriasis clinical type, and psoriasis area and severity index scores were recorded. Patients were divided into 2 subgroups as mild (psoriasis area and severity index < 10) and moderate/severe psoriasis (psoriasis area and severity index ≥ 10). Systemic immune-inflammation index was calculated by using neutrophil, platelet, and lymphocyte counts in complete blood count (neutrophil platelet/lymphocyte). The differences in systemic immune-inflammation index between groups and correlations between systemic immune-inflammation index and psoriasis area and severity index were analyzed.

Results: Two hundred nineteen cases with psoriasis and 200 controls were included. Systemic immune-inflammation index values were found to be significantly higher in patients with psoriasis than in controls ($P = .021$). The correlation coefficients between psoriasis area and severity index scores and systemic immune-inflammation index values in all patients, in patients with mild psoriasis, and in patients with moderate/severe psoriasis were $P < .01$, $r = 0.196$; $P < .05$, $r = 0.215$, and; $P < .05$, $r = 0.217$, respectively. There was no statistically significant correlation between systemic immune-inflammation index and types of psoriasis. Also systemic immune-inflammation index >510, 69 was determined as a cutoff point with a sensitivity of 52.5% and specificity of 82.5%.

Conclusion: Systemic immune-inflammation index was found to be significantly higher in patients with psoriasis than in healthy controls with a discriminant ability. Systemic immune-inflammation index may serve as a supportive method in clinical settings.

Keywords: Psoriasis, systemic immune-inflammation index, PASI, biomarker

INTRODUCTION

Psoriasis (PsO) is a chronic inflammatory skin disease that affects 0.5%-11.4% of the general population.[1] It is a physically, socially, and psychologically disabling disease with a clinical course presenting remissions and relapses and negatively affecting the quality of life of the patients.[2,3] The assessment of the disease is generally based on clinical evaluations as no useful laboratory biomarker for PsO severity has been defined. Biomarkers using routine laboratory tests accurately presenting psoriasis severity may have important practical values.[3]

Systemic immune-inflammation index (SII) which is based on neutrophil, platelet, and lymphocyte counts (neutrophil × platelet/lymphocyte) has been defined as a new inflammatory index that has been reported to be associated with poor outcomes, especially in several malignancies and disease activity in several inflammatory diseases.[4-6]

Systemic immune-inflammation index has also been investigated in PsO in a limited number of studies in terms of its prognostic role and its utility in the management of patients with PsO.[7,8] However, the role of SII as a biomarker in PsO as a disease with clinically distinct types still needs needed to be clarified.

The primary aim of this study was to investigate the SII as a biomarker of PsO skin disease severity and the

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secondary aim was to evaluate its possible relation with PsO clinical types.

METHODS

Study Design and Population

Our study was designed as a case–control observational study which was performed in Ataturk University School of Medicine Dermatology Clinic in accordance with the Declaration of Helsinki principles. The protocol of the present study was approved by the local Ethics Committee (Atatürk University School of Med Ethical Committee January 27, 2022/1-53), and an informed consent was taken from all the participants. After calculating the sample size as 190 (with 95% CI and 5% deviation; 95% power) 219 consecutive patients with PsO and 200 healthy controls were included in this study. Our inclusion criteria were being older than 18 years old, having a PsO diagnosis for the patient group, and demographically similar healthy participants without known diseases for the control group. Our exclusion criteria were the presence of pregnancy or lactation, any other inflammatory (as well as arthritis) or autoimmune disease, infectious diseases, hematological disorders, and malignancies.

Evaluations

Demographic features (age and gender) and disease duration (months) were recorded.

For clinical evaluations, PsO clinical type (plaque, guttate, inverse, pustular, erythrodermic, or palmoplantar PsO) and psoriasis area and severity index (PASI) scores were investigated. Psoriasis area and severity index was calculated as described.[8] Cases with PsO were divided into 2 subgroups according to skin involvement severity: PASI < 10 (mild psoriasis), and PASI ≥10 (moderate/severe psoriasis).[7]

Systemic immune-inflammation index was calculated by using neutrophil, platelet, and lymphocyte counts in complete blood count (neutrophil × platelet/lymphocyte).[8]

Erythrocyte sedimentation rate (ESR; mm/h) and C-reactive protein (CRP; mg/L) levels were obtained by using standard laboratory methods.

MAIN POINTS

- The systemic immune-inflammation index (SII) was found to be higher in patients with psoriasis (PsO) than in healthy controls.
- A cutoff point of SII was defined with a sensitivity of 52.5% and specificity of 82.5%.
- The SII, with its discriminant ability, might be a supportive method in clinical settings.

Statistical Analysis

Data were analyzed statistically using Statistical Package for Social Sciences for Windows 22.0 software (IBM SPSS Corp.; Armonk, NY, USA). The conformity of the data to normal distribution was assessed with the Shapiro–Wilk test. Descriptive frequencies were calculated for demographic and clinical variables. Categorical variables were evaluated by the chi-square test and continuous variables were evaluated by the Mann–Whitney *U*-test/Student's *t*-test. Correlations between PASI and SII scores were analyzed with Spearman correlation analysis by determining the rho coefficient and level of significance. Receiver operating characteristic curves were used to define the cutoff points of SII. A *P*-value of <.05 was considered statistically significant.

RESULTS

Two hundred nineteen cases with PsO (116 females and 103 males) and 200 controls (106 women and 94 men) were included in this investigation. The demographic features of the patients and controls were similar. The ESR and CRP levels were also similar between groups. However, SII values were found to be significantly higher in patients with PsO than in controls (*P* = .021). The demographic features, disease duration, and laboratory characteristics were shown in Table 1.

Table 1. The Demographic Features, Disease Duration, and Laboratory Characteristics of the Participants

	Patients with PsO, n = 219	Controls, n = 200	*P*
Age (years) Mean ± SD Minimum/maximum	41.11 ± 12.09 19/76	40.08 ± 13.11 21/74	.711
Gender, n (%) Female Male	116 (53) 103 (47)	106 (53) 94 (47)	.802
Disease duration (months) Mean ± SD Minimum/maximum	141.84 ± 118.12 2/720		
ESR (mm/h) Mean ± SD	16.12 ± 08	14.80 ± 10	.852*
CRP (mg/L) Mean ± SD	4.50 ± 1.0	3.80 ± 0.80	.685*
SII (10^3/mm^3) Mean ± SD	586.77 ± 260.71	445.25 ± 15.73	.021

*Student's *t*-test, Mann–Whitney *U*-test.
CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; NS, not significant; PsO, psoriasis; SII, systemic immune-inflammation index.

Table 2. The Correlations Between SII and PASI Scores

PsO Characteristics	PASI	SII	Correlation *P* *r*
All patients (n = 219)	9.08 ± 5.15	586.77 ± 260.71	.004 0.196
Patients with mild PsO (PASI < 10), (n = 132)	5.59 ± 2.37	557.65 ± 238.90	.035 0.215
Patients with moderate/severe PsO (PASI ≥ 10) (n = 87)	14.36 ± 3.43	630.95 ± 286.52	<.047 0.217
PsO clinical type			
Plaque, n = 175	9.33 ± 5.19	595.97 ± 260.60	<.010 0.193
Guttate, n = 15	11.87 ± 4.14	626.60 ± 359.34	.698
Inverse, n = 2	8.50 ± 4.80	393.00 ± 19.79	.749
Pustular, n = 5	7.00 ± 6.5	612.80 ± 200.96	0.635
Erythrodermic, n = 0			
Palmoplantar, n = 22	5.73 ± 3.52	488.18 ± 187.90	.734

Spearman correlation test.
PASI, psoriasis area and severity index; PsO, psoriasis; SII, systemic immune-inflammation index.

The correlations between PASI and SII were also investigated. The correlation coefficients between PASI scores and SII values in all patients, in patients with mild PsO, and in patients with moderate/severe PsO were $P < .01$, $r = 0.196$; $P < .05$, $r = 0.215$, and; $P < .05$, $r = 0.217$, respectively. These correlations seemed to be negligible since it was just below the limit. There was no statistically significant correlation between SII and types of PsO (Table 2).

We also analyzed the discriminatory ability of SII to distinguish patients with PsO and controls. The cutoff values were estimated based on the Youden index which maximizes the sum of sensitivity and specificity. The cutoff point was determined as >510.69 with a sensitivity of 52.5% and a specificity of 82.5% (P <.001 and AUC = 0.664) (Figure 1).

DISCUSSION

In this study investigating SII as a potential biomarker in PsO, SII was found to be significantly higher in cases with PsO than in healthy controls and it presented a negligible positive correlation with PASI scores in these patients. Also, SII > 510.69 was determined as a cutoff point with a sensitivity of 52.5% and specificity of 82.5%.

Psoriasis is a chronic inflammatory skin disease that affects approximately 125 million people worldwide.[3] Its evaluation has been still based on clinical findings since no useful laboratory parameter representing PsO severity is available. A practical laboratory biomarker may have important value in clinical settings.

In recent years, the prediction of inflammation based on full blood count parameters (FBC) has become a useful method. As FBC is a practical, cheap routine test, its subparameters' various combinations have become more widely used in predicting the status of various diseases.[5] Among these indices, SII has gained remarkable popularity as an immune-inflammation marker since it integrates the kinetics of 3 cell populations (neutrophil × platelet/lymphocyte) into 1 single parameter.[9] In clinical settings, it has been studied mainly in malignancies as an inflammation-based prognostic marker.[4] In dermatology practice, SII was investigated in some inflammatory diseases, and higher SII was found to be associated with active disease in these studies.[5,10]

Systemic immune-inflammation index was also investigated in PsO in 2 previous studies.[7,8] Systemic immune-inflammation index was found to be higher in cases with PsO than controls in both studies. Our results presenting significantly higher SII values in patients with PsO than controls contribute to these data. Unlike the previous 2 studies, we excluded PsO patients presenting any other inflammatory disease comorbidities (such as arthritis, thyroiditis, and inflammatory bowel diseases) in our study. By excluding other inflammatory conditions, we aimed to reach a PsO patient population without any other inflammatory conditions that can affect the inflammatory response in order to analyze the relation only between SII and PsO skin disease severity. Showing significantly higher SII scores in patients with PsO than controls and negligible positive correlation between SII and PASI scores

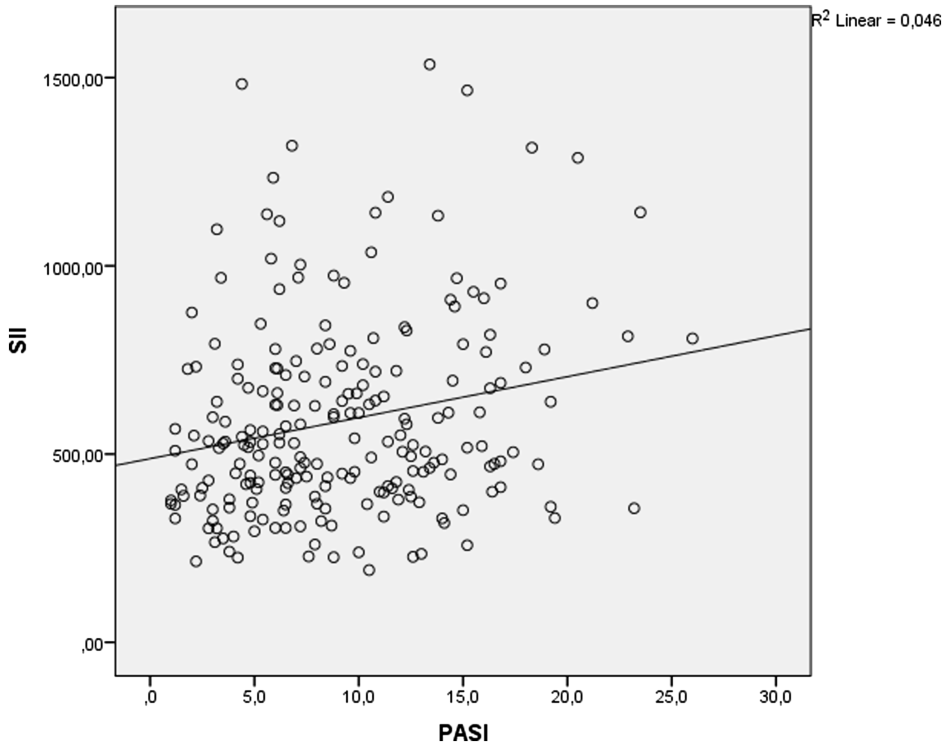

Figure 1. The positive correlation between SII and PASI scores.
PASI, psoriasis area and severity index; SII, systemic immune-inflammation index. P = .004, r = 0.196.

in a PsO patient population without any other inflammatory condition may lead to an objective conclusion that higher SII values might relatively weakly reflect severe skin disease in PsO. In our study, we also evaluated a possible relation between SII and PsO clinical types. However, there was no statistically significant correlation between them. Since there were a limited number of patients in some clinical types, further studies are needed to analyze this association.

The limited number of patients with different clinical types of PsO other than plaque form was the main limitation of our study. Our results obtained from a relatively large sample size and from PsO patients without any other inflammatory disease comorbidities as possible confounders can be considered as the main strengths of the present study.

The results of our study presented that SII was higher in patients with PsO with a negligible correlation with skin disease severity. Systemic immune-inflammation index, as a simple, practical, and cost-effective tool, appeared as an informative biomarker of the skin disease severity in our study. However, it should be kept in mind that FBC indices may be affected by several factors such as anemia, thrombocytopenia, and acute infection.[5,11-14] Since SII includes 3 parameters of FBC; platelets, neutrophils, and lymphocytes that participate in the inflammatory process, it may reflect more accurate information about inflammation.[15,16,17] The higher counts of the first 2 parameters may define underlying inflammation, while lower counts of lymphocytes may express an uncontrolled inflammatory pathway.[15] The main strength of SII has been reported as the inclusion of platelet count as they take part in crucial immune-mediated processes such as producing inflammatory cytokine and play important roles in coagulation, fibrinolysis, tissue regeneration, and angiogenesis.[8] The SII score, as a combined marker of 3 hemostatic system indices, may contribute additional information regarding the inflammatory response of the body.[15] In our study, our results supported SII as a practical informative tool reflecting PsO skin severity.

In conclusion; SII was found to be higher in patients with PsO than in healthy controls with a discriminant ability. Systemic immune-inflammation index may serve as a supportive method in clinical settings.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Atatürk University (Date: January 27, 2022, number: 1-53).

Informed Consent: Written informed consent was obtained from all the participants who participated in this study.

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REFERENCES

1. Michalek IM, Loring B, John SM. A systematic review of worldwide epidemiology of psoriasis. *J Eur Acad Dermatol Venereol*. 2017;31(2):205-212. [CrossRef]
2. Melikoglu M. Sleep quality and its association with disease severity in psoriasis. *Eurasian J Med*. 2017;49(2):124-127. [CrossRef]
3. Zhou J, Li Y, Guo X. Predicting psoriasis using routine laboratory tests with random forest. *PLOS ONE*. 2021;16(10): e0258768. [CrossRef]
4. Yang R, Chang Q, Meng X, Gao N, Wang W. Prognostic value of systemic immune-inflammation index in cancer: A meta-analysis. *J Cancer*. 2018;9(18):3295-3302. [CrossRef]
5. Tanacan E, Dincer D, Erdogan FG, Gurler A. A cutoff value for the Systemic Immune-Inflammation Index in determining activity of Behçet disease. *Clin Exp Dermatol*. 2021;46(2): 286-291. [CrossRef]
6. Wu J, Yan L, Chai K. Systemic immune-inflammation index is associated with disease activity in patients with ankylosing spondylitis. *J Clin Lab Anal*. 2021;35(9):e23964. [CrossRef]
7. Yorulmaz A, Hayran Y, Akpinar U, Yalcin B. Systemic immune-inflammation index (SII) predicts increased severity in psoriasis and psoriatic arthritis. *Curr Health Sci J*. 2020;46(4):352-357. [CrossRef]
8. Dincer Rota DD, Tanacan E. The utility of systemic-immune inflammation index for predicting the disease activation in patients with psoriasis. *Int J Clin Pract*. 2021;75(6):e14101. [CrossRef]
9. Walzik D, Joisten N, Zacher J, Zimmer P. Transferring clinically established immune inflammation markers into exercise physiology: focus on neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio and systemic immune-inflammation index. *Eur J Appl Physiol*. 2021;121(7):1803-1814. [CrossRef]
10. Tanacan E, Dinçer Rota D, Oktem R, Erdogan FG. The correlation of systemic immune-inflammation index, neutr ophil-to-lymphocyte ratio, derived neutrophil-to-lympho cyte ratio, and platelet-to-lymphocyte ratio with disease severity in recurrent aphthous stomatitis. *J Cosmet Dermatol*. 2022;21(10):4858-4863. [CrossRef]
11. Alan S, Tuna S, Türkoğlu EB. The relation of neutrophil-tolymphocyte ratio, platelet-to-lymphocyte ratio, and mean platelet volume with the presence and severity of Behcet's syndrome. *Kaohsiung J Med Sci*. 2015;31(12):626-631. [CrossRef]
12. Vayá A, Rivera L, Todolí J, et al. Haematological, biochemical and inflammatory parameters in inactive Behçet's disease. Its association with red blood cell distribution width. *Clin Hemorheol Microcirc*. 2014;56(4):319-324.
13. Yolbas S, Yildirim A, Gozel N, Uz B, Koca SS. Hematological indices may be useful in the diagnosis of systemic lupus erythematosus and in determining disease activity in Behcet's disease. *Med Princ Pract*. 2016;25(6):510-516. [CrossRef]
14. Sun Y, Li W, Li AJ, Su H, Yue J, Yu J. Increased Systemic Immune- Inflammation Index independently predicts poor survival for hormone receptor-negative, HER2-positive breast cancer patients. *Cancer Manag Res*. 2019;11:3153-3162. [CrossRef]
15. Ustundag Y, Huysal K, Gecgel SK, Unal D. Relationship between C-reactive protein, systemic immuneinflammation index, and routine hemogram-related inflammatory markers in low-grade inflammation. *Int J Biochem*. 2018;1: 24-28.
16. Furuncuoğlu Y, Tulgar S, Dogan AN, Cakar S, Tulgar YK, Cakiroglu B. How obesity affects the neutrophil/lymphocyte and platelet/lymphocyte ratio, systemic immune-inflammatory index and platelet indices: a retrospective study. *Eur Rev Med Pharmacol Sci*. 2016;20(7):1300-1306.
17. Hu B, Yang XR, Xu Y, et al. Systemic immune-inflammation index predicts prognosis of patients after curative resection for hepatocellular carcinoma. *Clin Cancer Res*. 2014;20(23): 6212-6222. [CrossRef]