

ORIGINAL ARTICLE

Investigation of the relationship between inflammatory blood parameters and seborrheic dermatitis

Mustafa Tosun MD  | Rukiye Yasak Güner MD  | Melih Akyol MD

Dermatology Department, Medicine Faculty, Sivas Cumhuriyet University, Sivas, Turkey

Correspondence

Mustafa Tosun, Dermatology Department, Sivas Cumhuriyet University School of Medicine, Sivas 58140, Turkey.
Email: mustafatosun@cumhuriyet.edu.tr

Funding information

None.

Abstract

Objective: Seborrheic dermatitis (SD) is a chronic inflammatory disease. The etiology of the disease is still unknown. The systemic immune-inflammation index (SII), red cell distribution width (RDW), mean platelet volume (MPV), C-reactive protein (CRP), monocyte to HDL cholesterol ratio (MHR), platelet to lymphocyte ratio (PLR), and neutrophil to lymphocyte ratio (NLR) have all been reported as inflammatory markers in recent studies. However, these inflammatory markers have not been explored in SD patients. This study aimed to explore inflammatory and hematological parameters in SD patients with healthy controls (HCs) and evaluate their possible relationship with disease severity.

Materials and Methods: One hundred patients who presented to our hospital were diagnosed with SD and 74 HCs were retrospectively included in our study. The seborrheic dermatitis area severity index (SDASI) score was used to assess the severity of the SD.

Results: The patient group's mean PLR, MPV ve CRP levels were statistically significantly higher than the HCs ($p < 0.05$). There was no statistically significant difference in the patients compared with the control group regarding RDW, NLR, MHR, and SII levels ($p > 0.05$). There was no statistically significant correlation between NLR, PLR, MPV, monocyte/HDL cholesterol, SII levels with age, and SDASI in the patient group. There was a significant correlation between CRP with age and RDW with SDASI score.

Conclusion: Hematological parameters and CRP are low-cost tests. These tests can be used to define inflammation levels in inflammatory diseases. This study shows that PLR, CRP, and MPV may be used as novel inflammatory markers in SD.

KEYWORDS

immunology, inflammation, seborrheic dermatitis

1 | INTRODUCTION

Seborrheic dermatitis (SD) is a chronic inflammatory dermatological disease characterized by itchy, erythema, and squamous lesions. SD typically affects the sebaceous areas of the scalp, face, glabella, ears, behind the ears, eyebrow, upper chest, and back.^{1,2} Many etiological factors play a role. These factors include age, sex, psychological stress, seasonal changes, seborrhea, hormones, and Malassezia. In

recent years, SD pathophysiology has focused on immunological and biomolecular pathways. Many cytokines such as TNF- α , IL-12, IL-1 β and beta-defensins have increased in SD.³

C-reactive protein (CRP) and hematological parameters are the diagnostic markers in numerous inflammatory diseases. Neutrophil to lymphocyte ratio (NLR), mean platelet volume (MPV), and platelet to lymphocyte ratio (PLR) are calculated from complete blood count (CBC) parameters and can be used as inflammatory markers in many

inflammatory diseases.^{4,5} In addition, a new index named the systemic immune-inflammation index (SII) has recently been calculated from CBC parameters (platelets \times neutrophils /lymphocytes), and it is widely used in many inflammatory diseases as a prognostic factor. It has been reported that it can be used as a prognostic factor in Behçet's disease.⁶

Neutrophil to lymphocyte ratio, PLR, monocyte to HDL cholesterol ratio (MHR), MPV, red cell volume distribution width (RDW), and CRP are essential biomarkers of systemic inflammation.^{7,8} In addition, recent studies reported that these biomarkers could be used for inflammation in rosacea and pityriasis rosea, which are inflammatory skin diseases such as SD.^{9,10}

The relationship between many dermatological diseases and CBC parameters has been investigated in the literature. However, a limited number of studies exploring hematological parameters in SD. Therefore, this study aimed to examine inflammatory and CBC parameters in SD patients and evaluate their possible relationship with disease severity.

2 | MATERIALS AND METHODS

The approval of our study was obtained from the Ethics Committee of the Medical Faculty of Cumhuriyet University (approval number: 2021-05/35, date: 26.05.2021). This study included one hundred patients who were followed up in our clinic with SD between May 2020 and September 2021. Patients under eighteen, those with active infection, diabetes mellitus, hypertension, acute/chronic liver or kidney failure, chronic or active inflammatory disease, and other autoimmune diseases were not included in our study. Our control group comprised 74 sex-and-age matched healthy volunteers without any systemic disease, who did not take any systemic medications and who gave blood for other reasons. This was a retrospective study conducted. CBC parameters (RDW, MPV, NLR, monocyte/HDL, and PLR), CRP ve SII of the SD patients, and HCs were recorded. These parameters were compared with the HCs.

The seborrheic dermatitis area severity index (SDASI) was used to measure SD symptom severity. Accordingly, nine anatomic sites desquamation, erythema, and pruritus were graded as 3 and 0 as 3= severe, 2= moderate, 1= mild, and 0= none. The score of each region was multiplied by the constant for the area (scalp [0.4], forehead [0.1], eyebrow [0.1], nasolabial [0.1], auricular [0.1], postauricular [0.1], back [0.2], cheek or chin [0.1], and intermammary [0.2]), and the total was calculated as the SDASI score.¹¹

The data obtained from this study were uploaded to SPSS (Ver: 22.0) software package and evaluated. Mean \pm SD was provided for quantitative variables as descriptive statistics. Whether the distribution of continuous data is normal or not was examined using the Kolmogorov-Smirnov test. Inflammatory parameters of SD and HCs were compared using Student's *t*-test. The Chi-square test was used to compare categorical ratios. The Pearson correlation test was employed to establish whether there's any statistically significant relationship between quantitative variables. Bland-Altman analysis was used to compare whether the results of CRP, MPV, and PLR

TABLE 1 The demographic characteristics of healthy control and patient groups

	Patients <i>n</i> = 100	Healthy controls <i>n</i> = 74	<i>p</i>
Sex (female)	44 (%44)	43 (%58)	0.09
Age (years)	35.22 \pm 9.89	37.60 \pm 13.92	0.18
SDASI	3.65 \pm 3.22		
NLR	1.82 \pm 0.59	2.02 \pm 1.47	0.25
PLR	135.30 \pm 39.60	116.55 \pm 40.79	0.004*
MPV	8.93 \pm 1.41	8.51 \pm 1.18	0.03*
MHR	0.01 \pm 0.01	0.01 \pm 0.005	0.17
RDW	13.16 \pm 1.03	13.02 \pm 2.28	0.66
CRP	3.85 \pm 3.60	2.60 \pm 2.50	0.009*
SII	542.32 \pm 391.07	489.16 \pm 217.32	0.274

Note: **p* < 0.05.

Abbreviations: CRP, C reaktif protein; MHR, monocyte/HDL cholesterol; MPV, mean platelet volume; NLR, neutrophil lymphocyte ratio; PLR, platelet lymphocyte ratio; RDW, red cell volume distribution width; SDASI, seborrheic dermatitis area severity index; SII, Sistemik Inflatuar Indeks.

could substitute for each other. A *p*-value of A value of *p* < 0.05 was accepted as statistically significant.

3 | RESULTS

In this study, 56 males and 44 females were included in the SD patient group, and 43 females and 34 males were in the HCs. The mean age of the patient group was 35.22 \pm 9.89 years, and the mean age of the HCs was 37.60 \pm 13.92 years. The mean SDASI of the patient group was 3.65 \pm 3.22. There was no statistically significant difference between patients and HCs in terms of gender and age (*p* > 0.05). There is 22 (22%) patients with disease duration (years) less than one year, 40 (40%) patients between 1 and 5 years, 21 (21%) patients between 5 and 10 years, and 17 (17%) patients with ten years or more in this study.

The patient group's mean PLR, MPV ve CRP levels were statistically significantly higher than the HCs (*p* < 0.05). However, there was no statistically significant difference in the patients compared with the control group in terms of NLR, RDW, MHR, and SII levels (*p* > 0.05) (Table 1) (Figure 1).

No statistically significant correlation between NLR, PLR, MPV, monocyte/HDL cholesterol, SII levels with age, and SDASI in the patient group. There was a significant positive correlation between CRP with age and RDW with SDASI level. RDW values increased statistically significantly with increasing SDASI score (*r* = 0.330 and *p* = 0.025). CRP values increased statistically significantly with increasing age (*r* = 0.344 and *p* = 0.000) (Table 2).

The correlations among the CRP, MPV, and PLR were statistically assessed by using Bland-Altman analysis. CRP and MPV could substitute for each other. MPV and PLR could not account for each other. CRP and PLR could not account for each other (Figure 2).

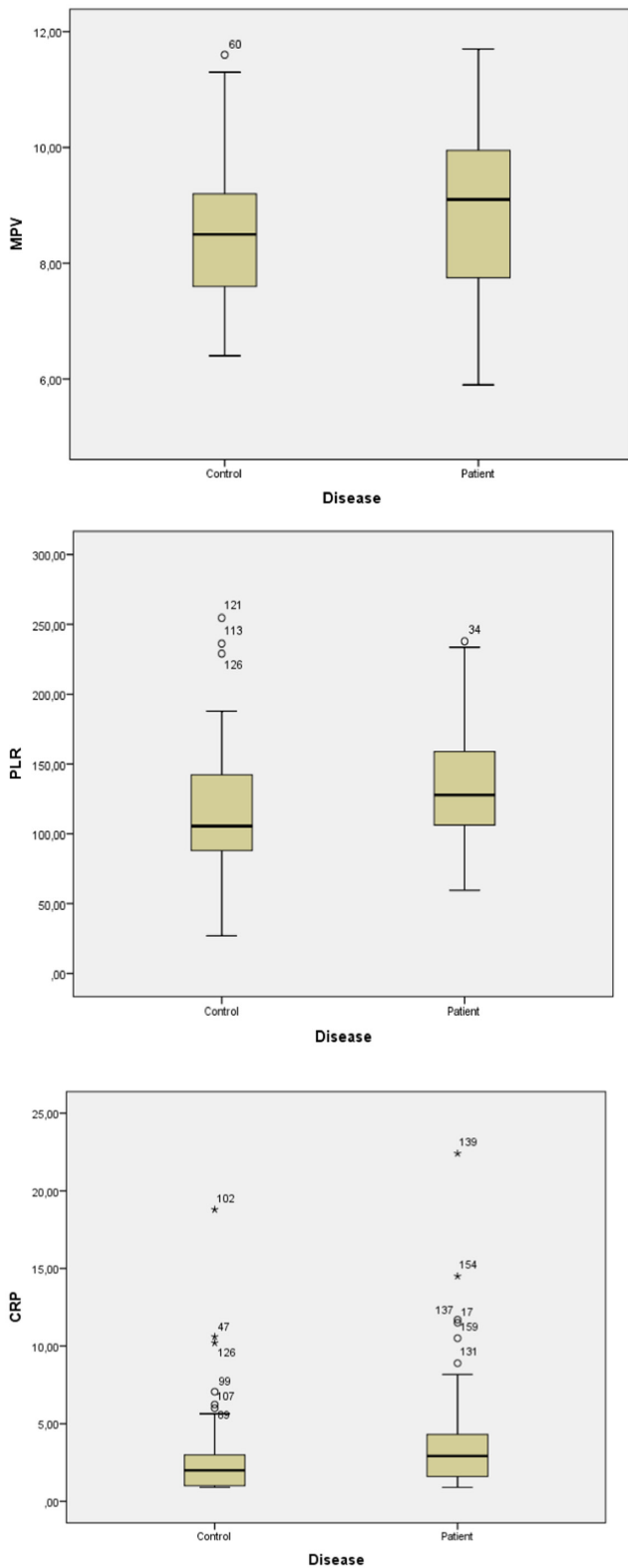


FIGURE 1 Comparison of different measurement for the patients and healthy controls

4 | DISCUSSION

Seborrheic dermatitis is an inflammatory disease. IL-1 α , IL-8, TNF- α , such as many cytokines, cause inflammation in SD. SD is part of the inflammatory diseases group of the skin, such as atopic dermatitis

TABLE 2 Correlation coefficients between age, SDASI score, NLR, PLR, MPV, Monocyte/HDL, RDW, CRP, and SII levels in the patient group and significance levels

	Age		SDASI	
	Correlation Coefficient	<i>p</i>	Correlation Coefficient	<i>p</i>
NLR	0.014	0.855	-0.173	0.251
PLR	0.019	0.813	-0.212	0.163
MPV	0.019	0.811	0.072	0.635
MHR	-0.091	0.328	0.05	0.742
RDW	0.157	0.089	0.330	0.025*
CRP	0.344	0.000*	0.047	0.763
SII	0.032	0.685	-0.257	0.089

Note: **p* < 0.05.

Abbreviations: CRP, C reaktif protein; MHR, monocyte/HDL cholesterol; MPV, mean platelet volume; NLR, neutrophil lymphocyte ratio; PLR, platelet lymphocyte ratio; RDW, red cell volume distribution width; SDASI, seborrheic dermatitis area severity index; SII, Sistemik Inflamatuvar Indeks.

and acne.¹² CBC parameters and CRP play an important role in systemic inflammation and indicate active inflammation. RDW, PLR, MLR, MPV, RDW, NLR, and SII were calculated by using CBC parameters. These parameters are used as new inflammatory markers, which are considered as cost-effective and simple laboratory parameters indicating systemic inflammation in many diseases.^{5,13,14}

This study aimed to explore inflammatory and CBC parameters in patients with SD and evaluate their possible relationship with disease severity (SDASI). To the best of our knowledge, this study is the first to investigate the relationship between disease severity and these markers. PLR, MPV, and CRP values were statistically significantly higher in the SD patients group than in the healthy controls. NLR, MHR, RDW, and SII levels were not found significant differences in SD patients and HCs group. A positive correlation between age with CRP levels and RDW levels with SDASI was found in the seborrheic dermatitis group. When it was evaluated whether the high detected PLR, MPV, and CRP values in the seborrheic dermatitis group should be used interchangeably in the SD patients group, CRP and MPV could substitute for each other. However, MPV with PLR and CRP with PLR could not account for each other.

Mean platelet volume is a marker of platelet aggregation and activation that increases psoriasis and Behçet's disease.^{15,16} While previous studies have found no significant difference in MPV levels pityriasis rosea and vitiligo, MPV levels were significantly higher in the psoriasis group than in the HCs.^{8,9,17,18} In this study, MPV levels were significantly increased in the SD patients group compared with the HCs.

Red cell distribution width has been examined in recent studies. TNF- α , IL-10, IL-6, and IL-1 may be the cause for increased RDW levels.¹⁹ In previous studies, while RDW levels have been found low in pityriasis rosea, there was no significant difference in RDW levels in cutaneous vasculitis and alopecia areata.^{9,20,21} In our study, there

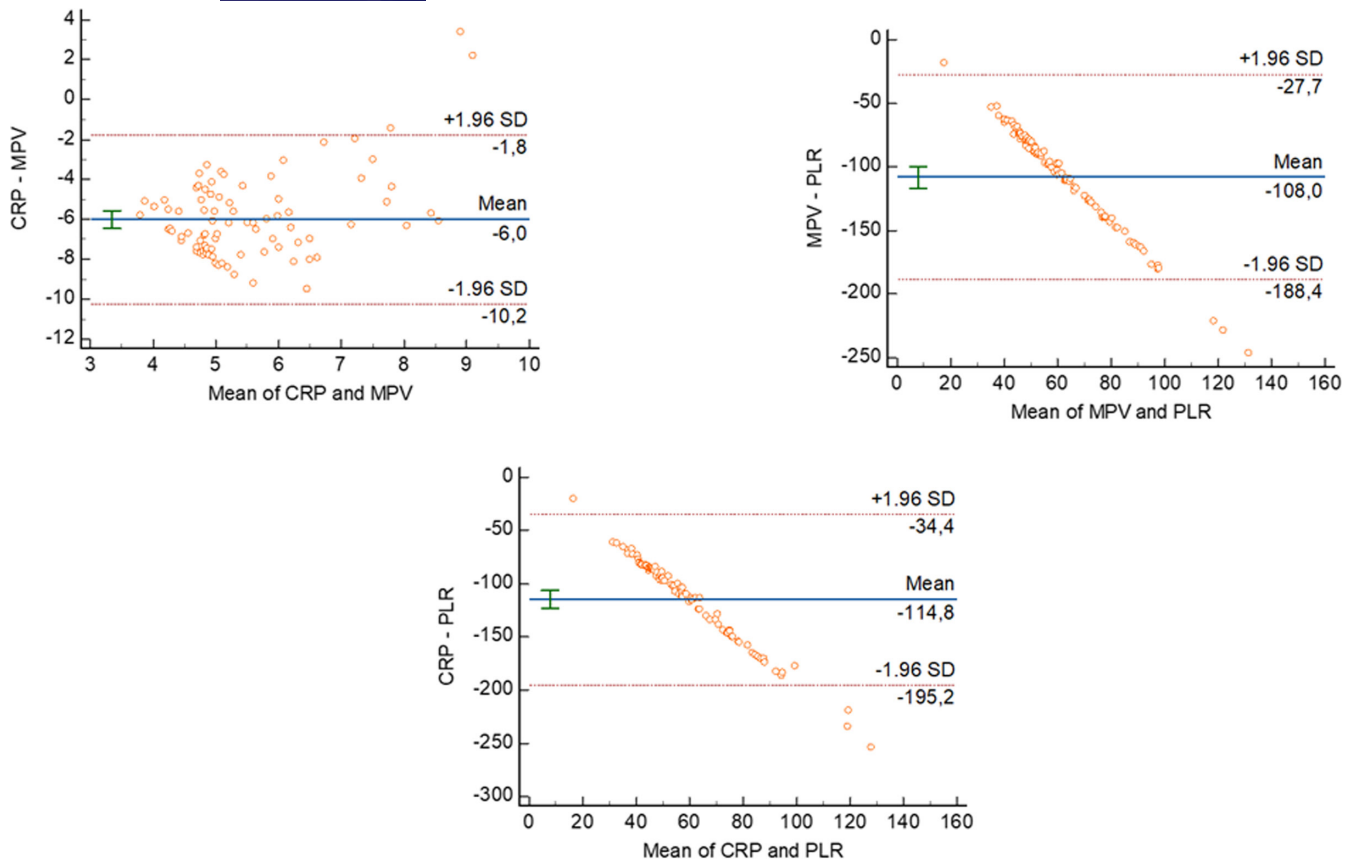


FIGURE 2 Comparison of different measurement methods via Bland–Altman analysis

was not found a significant difference in RDW values in the SD patients group compared with the HCs group.

In a previous study, PLR and NLR values were examined in psoriasis patients, and NLR level was high compared with the HCs.²² In the other study, PLR and NLR levels were high in psoriasis patients compared with the HCs.⁸ In their research, Islamoglu et al.²¹ reported no significant difference in alopecia areata patients in terms of NLR and PLR levels compared with the HCs. In our study, while we did not find a significant difference between the NLR values of SD patients and the HCs group, find a significant difference between the PLR levels of SD patients and the HCs group.

C-reactive protein was used as another inflammatory marker in this study. We found that CRP levels of the SD patients were significantly higher than the HCs. Beygi et al.²³ have reported CRP levels elevated in psoriasis. In another study, CRP values were found to be higher in alopecia areata patients than in the HCs group.²¹

Monocyte to HDL cholesterol ratio is a novel inflammatory marker which the anti-inflammatory effect of the MHR is based on oxidative, the anti-inflammatory effect of HDL, and inflammatory effects of monocytes.^{24,25} Several studies have reported that MHR was found to be higher in patients with Behçet's disease, vitiligo, and psoriasis.^{17,26,27} However, in this study, MHR was not found to be different in patients with SD compared with the HCs group.

Recently, the SII was developed. The SII is based on neutrophil, lymphocyte, and platelet counts, which can project immune

status and inflammatory balance. SII, a new index, has been used in oncology and other branches of medicine as an inflammatory marker.²⁸ We found that SII was not found to be the difference in patients with SD compared with HCs. Previous studies have shown that higher scores in the SII indicate increased inflammatory response.^{6,29}

A limitation of this study is that first, our study was a retrospective study, and therefore, we were able to include only the patients whose records were available in our hospital's automation system in the study. Second, the number of HCs and patients were relatively small. Further prospective studies with a larger group and multi-center size should be handled in the future.

5 | CONCLUSION

In conclusion, this study was found elevated PLR, MPV, and CRP levels in the SD patients. Statistically significant correlation was found between CRP with age and RDW with SDASI score. The other hematological parameters were the same as those of the HCs, and there was no correlation between the SDASI score and other markers. These results have concluded that CRP, MPV, and PLR may be used as a novel inflammatory marker in seborrheic dermatitis. Further prospective controlled studies are necessary to clarify the relationship between inflammatory markers and SD.

ACKNOWLEDGEMENT

Not applicable.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

ETHICAL APPROVAL

Approval of this study was obtained from the Ethics Committee of the Medical Faculty of Cumhuriyet University (approval number:2021-05/35, date: 26.05.2021).

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Mustafa Tosun  <https://orcid.org/0000-0002-6189-8016>

Rukiye Yasak Güner  <https://orcid.org/0000-0002-5154-4652>

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How to cite this article: Tosun M, Yasak Güner R, Akyol M. Investigation of the relationship between inflammatory blood parameters and seborrheic dermatitis. *J Cosmet Dermatol.* 2022;21:5111–5115. doi:[10.1111/jocd.14984](https://doi.org/10.1111/jocd.14984)