

Neutrophil / lymphocyte ratio, platelet / lymphocyte ratio, mean platelet volume and C-reactive protein values in psoriatic arthritis patients

Isa An¹, Derya Ucmak², Murat Ozturk³, Mustafa Aksoy⁴, Ismail Yildiz⁵, Egemen Ucan²

¹Sanliurfa Training and Research Hospital, Department of Dermatology, Sanliurfa, Turkey

²Dicle University Faculty of Medicine, Department of Dermatology, Diyarbakir, Turkey

³Van Training and Reserch Hospital, Department of Dermatology, Van, Turkey

⁴Harran University Faculty of Medicine, Department of Dermatology, Sanliurfa, Turkey

⁵Dicle University Medical Faculty, Department of Biostatistics and Medical Informatics, Diyarbakir, Turkey

Copyright © 2018 by authors and Annals of Medical Research Publishing Inc.

Abstract

Aim: Studies have shown that neutrophil / lymphocyte ratio (NLR), platelet / lymphocyte ratio(PLR), mean platelet volume(MPV) and C-reactive protein(CRP) are higher in psoriatic arthritis patients than in the control group. In this study, NLR, PLR and MPV values of patients with psoriatic arthritis were calculated and if these parameters were related to CRP levels.

Material and Methods: 74 psoriatic arthritis patients and 77 healthy controls without any systemic, infectious and autoimmune diseases were included in the study. Patients were divided into two groups according to their CRP values: normal (0-0.5 mg / dl) and high (> 0.5 mg / dl)

Results: NLR, MPV and CRP values in the patient group were significantly higher than the control group. PLR value in the patient group was higher than the control group but the difference between them was not statistically significant. There was a statistically significant relationship between CRP and NLR and MPV values in psoriatic arthritis patients.

Conclusion: Since NLR and MPV were significantly higher in psoriatic arthritis patients than in the control group and there was a statistically significant relationship with CRP elevation, it was thought that they were appropriate parameters to show inflammation in patients with psoriatic arthritis.

Keywords: Neutrophil / lymphocyte Ratio; Ppsoriatic arthritis; Platelet / lymphocyte Ratio; Mean Platelet Volume.

INTRODUCTION

Psoriasis is a chronic, inflammatory, T-cell-mediated, systemic disease characterized by erythematous, papulosquamous lesions (1). Psoriatic arthritis (PsA) is an inflammatory arthritis that may occur in both peripheral joints and axial skeleton and occurs in 6-42% of patients with psoriasis (2,3,4). Various chemokines and adhesion molecules, proinflammatory cytokines such as tumor necrosis factor α (TNF- α), interleukin (IL) -17 and IL-22 released after T cell activation, initiate the inflammatory process in psoriasis and PsA (1,5).

In recent years, neutrophil/lymphocyte ratio (NLR), platelet / lymphocyte ratio (PLR), mean platelet volume (MPV) and C-reactive protein (CRP) have been shown to be important

indicators of systemic inflammation (6,7,8,9). Platelets are known to play a role in the pathogenesis of psoriasis and PsA (10). NLR and PLR were found to be related to IL-6 and TNF- α in the pathogenesis of psoriasis and PsA (4,11).

Studies have shown that NLR, PLR and MPV are higher in PsA patients than in the control group (4,12,13). In this study, NLR, PLR and MPV values were calculated in PsA patients and it was investigated whether these parameters were related with CRP levels.

MATERIAL and METHODS

This retrospective study included 74 PsA patients followed up in our department of dermatology in university hospital between January 2010 and December 2017 with a control

Received: 05.02.2019 Accepted: 20.03.2019 Available online: 26.03.2019

Corresponding Author: Isa An, Sanliurfa Training and Research Hospital, Department of Dermatology, Sanliurfa, Turkey

E-mail: is_an89@hotmail.com

group consisted of 77 patients who had no systemic disease such as psoriasis, PsA, diabetes mellitus, hypertension, thyroid disease, malignancy and infectious diseases. Classification of Psoriatic Arthritis (CASPAR) criteria were used for the diagnosis of PsA (14). To meet the CASPAR criteria, a patient must have inflammatory articular disease (joint, spine, or enthesal) with 3 points from the following 5 categories:

1. Evidence of current psoriasis, a personal history of psoriasis, or a family history of psoriasis.

Current psoriasis is defined as psoriatic skin or scalp disease present today as judged by a rheumatologist or dermatologist (Current psoriasis is assigned a score of 2; all other features are assigned a score of 1).

A personal history of psoriasis is defined as a history of psoriasis that may be obtained from a patient, family physician, dermatologist, rheumatologist, or other qualified health care provider.

A family history of psoriasis is defined as a history of psoriasis in a first- or second-degree relative according to patient report.

2. Typical psoriatic nail dystrophy including onycholysis, pitting, and hyperkeratosis observed on current physical examination.

3. A negative test result for the presence of rheumatoid factor by any method except latex but preferably by enzyme-linked immunosorbent assay or nephelometry, according to the local laboratory reference range.

4. Either current dactylitis, defined as swelling of an entire digit, or a history of dactylitis recorded by a rheumatologist.

5. Radiographic evidence of juxtaarticular new bone formation, appearing as ill-defined ossification near joint margins (but excluding osteophyte formation) on plain radiographs of the hand or foot (14).

Age, gender, leukocyte count, neutrophil count, lymphocyte count, platelet count, NLR, PLR, MPV and CRP values of patients and control group were recorded. The patients were divided into two groups according to their CRP values: normal (0-0.5 mg / dl) and high (> 0.5 mg / dl).

Patients with a history of any systemic disease, inflammatory and infectious disease and organ malignancy were excluded. The CRP value was calculated by Beckman Coulter nephelometric method (IMMAGE 800, USA). The complete blood count was calculated by Cell-Dyn 3700 (optical scatter laser method, Abbott Diagnostics, Chicago, USA). The PLR value was calculated by dividing the platelet count by the number of lymphocytes. NLR value was calculated by dividing the number of neutrophils by lymphocyte count.

This work has been approved by the Institutional Review Board. Statistical analysis was performed using SPSS 21.0 for Windows (SPSS Inc., Chicago, IL, USA). The normal distribution assumption of the data was tested by the

Shapiro-Wilk test. Student's t test was used to compare mean values of two groups. $P < 0.05$ was considered statistically significant.

RESULTS

In our study, there wasn't statistically significant difference between the patient group (38 males, 36 females; mean age \pm ss 42.3 ± 14.7) and the control group (40 males, 37 females; mean age \pm ss) 42.3 ± 13.3 years) in terms of gender and age. ($p = 0.872$, $p = 0.862$, respectively) (Table 1).

The CRP value of the patients with PsA was 3.90 ± 2.66 and the CRP value of the control group was 0.55 ± 0.82 . The difference between the two groups was significant ($P = 0.001$) (Table 1).

The leukocyte count of the patients with PsA was $9.38 \pm 2.85 \times 10^3$ and the leucocyte count of the control group was $7.25 \pm 2.06 \times 10^3$. The difference between the two groups was significant ($P = 0.001$) (Table 1).

The neutrophil count of the patients with PsA was $6.12 \pm 2.51 \times 10^3$, the neutrophil count of the controls was $4.37 \pm 1.30 \times 10^3$. The difference between the two groups was significant ($P = 0.001$) (Table 1).

The lymphocyte count of patients with PsA was $2.41 \pm 0.74 \times 10^3$ and the lymphocyte count of the controls was $2.53 \pm 1.14 \times 10^3$. The difference between the two groups was not significant ($P = 0.431$) (Table 1).

The platelet count of the patients with PsA was $297.68 \pm 101.43 \times 10^3$, and the control platelet count was $258.71 \pm 69.44 \times 10^3$. The difference between the two groups was not significant ($P = 0.007$) (Table 1).

Table 1. Demographic characteristics and laboratory results of patients with psoriatic arthritis and healthy controls

	Psoriatic arthritis (n=74)	Healthy controls (n=77)	P value
Age (mean \pm SD, year)	42.3 \pm 14.7	42.3 \pm 13.3	0.872
Gender (male/female)	38/36	40/37	0.862
CRP (mean \pm SD, mg/dl)	3.90 \pm 2.66	0.55 \pm 0.82	0.001
Leukocyte count (mean \pm SD) $\times 10^3$	9.38 \pm 2.85	7.25 \pm 2.06	0.001
Neutrophil count (mean \pm SD) $\times 10^3$	6.12 \pm 2.51	4.37 \pm 1.30	0.001
Lymphocyte count (mean \pm SD) $\times 10^3$	2.41 \pm 0.74	2.53 \pm 1.14	0.431
Platelet count (mean \pm SD) $\times 10^3$	297,68 \pm 101,43	258,71 \pm 69,44	0,007
NLR (mean \pm SD)	2.95 \pm 2,56	1.95 \pm 0.93	0,002
PLR (mean \pm SD)	136.98 \pm 66,67	117.88 \pm 57,92	0,062
MPV (mean \pm SD)	9.98 \pm 1.21	6.75 \pm 0.72	0.001

NLR: Neutrophil / lymphocyte ratio, PLR: Platelet / lymphocyte ratio, MPV: Mean platelet volume, CRP: C-reactive protein, SD: Standard Deviation

NLR of the patients with PsA was 2.95 ± 2.56 , and the NLR of the control group was 1.95 ± 0.93 . The difference between the two groups was significant ($P = 0.002$) (Table 1).

NLR values were 2.85 ± 2.41 in CRP high group and 1.89 ± 0.91 in CRP normal group. The difference between the two groups was significant ($P = 0.001$) (Table 2).

Table 2. Relationship between CRP values and inflammatory parameters in patients with psoriatic arthritis

	CRP(0-0.5 mg/dl) (n=3)	CRP(>0.5mg/dl) (n=71)	P value
NLR(mean±SD)	1.89±0.91	2.85±2.41	0.001
PLR(mean±SD)	135.55 ±64.62	116.25±59.22	0.059
MPV(mean±SD)	9.42±1.7	6.89±0.91	0.001

NLR: Neutrophil / lymphocyte ratio, PLR: Platelet / lymphocyte ratio, MPV: Mean platelet volume, CRP: C-reactive protein, SD: Standard Deviation

The PLR value of the patients with PsA was 136.98 ± 66.67 , and the PLR value of the control group was 117.88 ± 57.92 . The difference between the two groups was not significant ($P = 0.062$) (Table 1).

The PLR value was 135.55 ± 64.62 in the CRP high group and 116.25 ± 59.22 in the CRP normal group. The difference between the two groups was not significant ($P = 0.059$) (Table 2).

MPV value of the patients with PsA was 9.98 ± 1.21 , and the MPV value of the control group was 6.75 ± 0.72 . The difference between the two groups was significant ($P = 0.001$) (Table 1).

MPV value was 9.42 ± 1.7 in the CRP high group, and was 6.89 ± 0.91 in the CRP normal group. The difference between the two groups was significant ($P = 0.001$) (Table 2).

DISCUSSION

Psoriasis is a chronic, inflammatory skin disease with a wide clinical presentation. On average, it is considered to be seen in 2-4% of the population. It is thought that the disease is caused by the common contribution of environmental and genetic factors. The disease that can be seen in all ages is rarely seen under 10 years (1,2,4). The occurrence of the disease is between 20-29 and 30-39 years old and between 50-59 and 60-69 years. While the disease affects male and female sexes equally, it differs genetically between geographies. It is observed less frequently in areas closer to the equator (2,3). Psoriasis usually involving the knee, elbow, sacral region and extensor regions of the extremities. Histological examination of the lesions shows T lymphocytes and neutrophil-rich cell infiltration (1,3). Patients with psoriasis are at risk for myocardial infarction, diabetes, hyperlipidemia, nonalcoholic fatty liver disease, cancer, anxiety and depression. Psoriasis significantly affects the quality of life of the patients (2,4).

The occurrence of PsA is almost entirely related to the immune system and probably shares the same pathogenic mechanisms as psoriasis. In PsA, the synovium was infiltrated by T cells, B cells and macrophages. Clonally expanded CD8 T cells are common in PsA. Plasmacytoid dendritic cells play a key role in psoriasis, and there is evidence that they have roles in PsA. Cytokines secreted from Th17 cells are important in PsA, psoriasis and other forms of spondylarthropathy (5). PsA can cause joint destruction and increased morbidity. Therefore, early diagnosis and intervention are very important for prevention of joint damage as well as functional impairment (3).

NLR is obtained by dividing the total neutrophil count by the number of lymphocytes. Being cheap and easily calculated are important advantages (15). NLR has been shown to increase in many diseases such as metabolic syndrome, hypercholesterolemia, renal diseases and malignancies, which are common in the community and which are caused by inflammation (6,7,15,16,17,18). Increased levels of TNF- α and IL-6, IL-12 and IL-17, which play a role in the pathogenesis of psoriasis and PsA, have been shown to increase the levels of NLR (2,19).

Asahina and et al. have shown that NLR is high in both psoriasis and PsA patients compared to the control group and is associated with systemic inflammation (4). The risk of cardiovascular disease is increased in patients with psoriasis and PsA (20). It has been reported that NLR and PLR elevation may be associated with increased risk of cardiovascular disease in PsA patients (3,22). Kim et al. reported that NLR was higher in patients with psoriasis compared to the control group. They also showed that elevation of NLR can be a useful biomarker in predicting PsA in psoriasis patients (3).

In our study, NLR was significantly higher in PsA patients compared to the control group. There was a statistically significant relationship between NLR and CRP levels.

Platelets are 2-4 μm in size composed of megakaryocytes, the largest cells of the bone marrow. The platelets contain many modulators such as TxA₂, platelet factor-4, alpha thromboglobulin, which play role in clotting, and they play an important role in hemostasis, inflammation and atherosclerosis (23). The platelets secrete significant amounts of secretory molecules such as proinflammatory molecules, various chemokines and cytokine-like factors (23). TNF- α is an important proinflammatory cytokine that can increase the inflammatory response caused by platelet activating factor (PAF) (23,24). TNF- α plays an important role in the pathogenesis of psoriasis and PsA (24). Pamuk et al reported that platelet-monocyte complexes were significantly higher in PsA patients compared to the control group and that active platelets were involved in the pathogenesis of psoriasis and PsA (10).

MPV is an indicator of platelet activation and function. Increased MPV is considered as an independent risk factor for acute myocardial infarction, hyperlipidemia and diabetes (2,4,12).

It is thought that high MPV levels in psoriasis may be related with TNF- α and also with activation of platelets (13). In a study performed by Kılıc et al., MPV values were higher in PsA patients compared to both psoriasis and control group. MPV can be used as a follow-up parameter in terms of PsA development, especially in patients with severe psoriasis (2). Canpolat et al. found that MPV was higher in patients with PsA than those without arthritis (13).

In our study, MPV was significantly higher in PsA patients than in the control group. There was a statistically significant relationship between MPV and CRP levels.

In recent years, PLR has been shown to be an indicator of systemic inflammation and is associated with prognosis in many cardiovascular diseases and chronic inflammatory diseases (19). Unal et al. found that PLR values were significantly higher in the patients with psoriasis than the control group and there was a positive correlation between PLR and CRP (19). Kim et al. showed that the elevation of PLR may be a useful biomarker for predicting PsA in psoriasis patients (3). Asahina et al showed that PLR reflects systemic inflammation in PsA patients. It has also been noted that PLR can also be used to monitor disease progression, especially to assess the inhibition of systemic inflammation after treatment (4).

In our study, there was no significant difference between the patients with PsA and the control group in terms of PLR value and no statistically significant relationship was found between PLR and CRP level.

CRP is an acute phase protein produced mainly by hepatocytes under the influence of cytokines such as IL-6 and TNF- α (25). Serum CRP levels were significantly higher in patients with psoriasis and a positive correlation was found between CRP levels and disease severity (26). Serum CRP levels were significantly increased in Japanese patients with psoriasis with active arthritis (27). In our study, CRP was significantly higher in patients with PsA compared to controls in similar to the data in the literature.

The main limitation of our study is absence of psoriatic arthritis activity scores of the patients. Therefore the possible correlation of NLR, PLR and MPV with disease severity could not be evaluated.

CONCLUSION

In conclusion, there was no significant difference between the PLR value of the patients with PsA and the control group, and there was no statistically significant relationship between PLR and CRP levels. Based on these data, it can be said that PLR is not an appropriate parameter in demonstrating inflammation in PsA patients. Since NLR and MPV were significantly higher in PsA patients compared to the control group, and a statistically significant relationship was found between them with CRP elevation, it was thought that they were an appropriate parameter for demonstrating inflammation in

PsA patients. Further studies are needed to uncover the possible correlation between psoriatic arthritis activity scores with NLR, TLR and MPV.

Competing interests: The authors declare that they have no competing interest.

Financial Disclosure: There are no financial supports

Ethical approval: The ethics committee was approved by the ethics committee of Dicle University Medical Faculty Hospital.

Isa An ORCID: 0000-0003-3366-4551

Derya Ucmak ORCID: 0000-0003-0675-5204

Murat Ozturk ORCID: 0000-0002-4499-3724

Mustafa Aksoy ORCID: 0000-0002-4966-1737

Ismail Yildiz ORCID: 0000-0001-5505-838X

Egemen Ucan ORCID: 0000-0003-2131-7237

REFERENCES

1. An İ. tatuaj komplikasyonu olarak tip 2 köbner fenomeni gelişen psoriasisli bir olgu. *Dermatoz* 2018;9:1809204.
2. Kılıc S, Resorlu H, Işık S, et al. Association between mean platelet volume and disease severity in patients with psoriasis and psoriatic arthritis. *Postepy Dermatol Alergol* 2017;34:126-30.
3. Kim DS, Shin D, Lee MS, et al. Assessments of neutrophil to lymphocyte ratio and platelet to lymphocyte ratio in Korean patients with psoriasis vulgaris and psoriatic arthritis. *J Derma-tol* 2016;43:305-10.
4. Asahina A, Kubo N, Umezawa Y, et al. Neutrophil-lymphocyte ratio, platelet-lymphocyte ratio and mean platelet volume in Japanese patients with psoriasis and psoriatic arthritis: Response to therapy with biologics. *J Dermatol* 2017;44:1112-21.
5. Kerschbaumer A, Fenzl KH, Erlacher L, et al. An overview of psoriatic arthritis - epidemiology, clinical features, pathophysiology and novel treatment targets. *Wien Klin Wochenschr* 2016;128:791-5.
6. Kasapkara HA, Aslan AN, Ayhan H, et al. Higer neutrophil to lymphocyte ratio is related to a lower ejectionfraction in bicuspid aortic valve patients. *Turk J Med Sci*. 2016;46:1144-50.
7. Özgehan G, Kahramanca Ş, Kaya İO, et al. Neutrophil-lymphocyte ratio as a predictive factor for tumor staging in colorectal cancer. *Turk J Med Sci* 2014;44:365-8.
8. Kılıç S, Işık S, Hiz MM, et al. The ischemia modified albumin and mean platelet volume levels in patients with Behçet's disease. *Postepy Dermatol Alergol* 2016;33:345-8.
9. Sahnaz P, Ulutas KT. İnsülin veya oral anti diyabetik ilaç alan tip 2 diyabetli hastalarda ortalama trombosit hacminin değerlendirilmesi. *Dicle Tıp Dergisi* 2015;42:399-403.
10. Pamuk GE, Nuri Pamuk O, Orum H, et al. Elevated platelet-monocyte complexes in patients with psoriatic arthritis. *Platelets* 2009;20:493-7.
11. Turkmen K, Erdur FM, Ozcicek F, et al. Platelet-to-lymphocyte ratio beter predicts inflammation than neutrophil-to-lymphocyte ratio in end-stage renal disease patients. *Hemodial Int* 2013;17:391-6.
12. Kim DS, Lee J, Kim SH, et al. Mean platelet volume is elevated in patients with psoriasis vulgar-is. *Yonsei Med J* 2015;56:712-8.
13. Canpolat F, Akpınar H, Eskiöğlü F. Mean platelet volume in psoriasis and psoriatic arthritis. *Clin Rheumatol* 2010;29:325-8.
14. Taylor W, Gladman D, Helliwell P, et al. Classification criteria for psoriatic arthritis: development of new criteria from a large international study. *Arthritis Rheum* 2006;54:2665-73.
15. Balta S, Cakar M, Demirkol S, et al. Higher neutrophil to

- lymphocyte ratio in patients with meta-bolic syndrome. Clin Appl Thromb Hemost 2013;19:579.
16. An I, Ucmak D, Ozturk M. Evaluation of neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio and mean platelet volume in patients with lichen planus. Ann Med Res 2019;26:161-4.
 17. An I, Ucmak D. Evaluation of neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, mean platelet volume, and C-reactive protein in patients with psoriasis vulgaris. Dicle Med J 2018;45:327-34.
 18. Cemil BC, Ataş H. Psoriasis Hastalarında Biyolojik Tedavinin Sistemik İnflamatuvar Belirteçler ve Plateletcrit Üzerine Etkisi. Dicle Tıp Dergisi.2016;43:477-83.
 19. Unal M, Küçük A, Ünal GÜ, et al. Psoriasisde ortalama trombosit hacmi, nötrofil/lenfosit oranı ve trombosit/lenfosit oranı. Turkderm 2015;49:112-6.
 20. Ogdie A, Yu Y, Haynes K, et al. Risk of major cardiovascular events in patients with psoriatic arthritis, psoriasis and rheumatoid arthritis: a population-based cohort study. Ann Rheum Dis 2015;74:326-32.
 21. Prey S, Paul C, Bronsard V, et al. Assessment of risk of psoriatic arthritis in patients with plaque psoriasis: a systematic review of the literature. J Eur Acad Dermatol Venereol 2010;24:31-5.
 22. Uslu AU, Küçük A, Sahin A, et al. Two new inflammatory markers associated with disease activity score-28 in patients with rheumatoid arthritis: neutrophil-lymphocyte ratio and platelet-lymphocyte ratio. Int J Rheum Dis 2015;18:731-5.
 23. Katoh N. Platelets as versatile regulators of cutaneous inflammation. J Dermatol Sci 2009;53:89-95.
 24. Schottelius AJ, Moldawer LL, Dinarello CA, et al. Biology of tumor necrosis factor-alpha implication for psoriasis. Exp Dermatol 2004;13:193-222.
 25. Coimbra S, Oliveira H, Reis F, et al. C-reactive protein and leucocyte activation in psoriasis vulgaris according to severity and therapy. JEADV 2010;24:789-96.
 26. Beygi S, Lajevardi V, Abedini R. C-reactive protein in psoriasis: a review of the literature JEADV 2014;28:700-11.
 27. Asahina A, Umezawa Y, Yanaba K, et al. Serum C-reactive protein levels in Japanese patients with psoriasis and psoriatic arthritis: long-term differential effects of biologics. J Dermatol 2016;43:779-84.