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Original Research Article

A Case-Control Observational Research Investigated the Mean Platelet Volume, Neutrophil-Lymphocyte Ratio, and Platelet-Lymphocyte Ratio in Individuals with Psoriasis

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Abstract

Aim: The aim of the present study was to assess the frequency of platelet activation and leukocyte infiltration by measuring MPV, NLR, and PLR.

Material & methods: A case-control observational study conducted in the Department of Skin and VD for the duration of 18 months. A total of 50 psoriasis cases and 50 healthy controls were included according to inclusion and exclusion criteria. Study populations are individuals diagnosed with psoriasis.

Results: Maximum patients were in between 15-34 years age group 56% in cases and 52% in control group. Age range of the cases and control was 18 to 66 years and 19 to 65 years respectively. The mean age of cases was 35.25±12.48 years and control was 32±14.26 years. Mean±SD value of MPV, NLR and PLR in study cases was 9.95±1.22, 4.36±8.52 and 294.92±86.82 where as in case of control values were 9.48±0.632, 4.56±8.52, 166.24±104.36 respectively. Both the MPV and PLR means are high in case of psoriasis patient. There was significant increase in MPV and PLR in psoriasis patient then healthy control group (p value was <0.05). NLR has not shown any significant difference in psoriasis and control group. The severity of psoriasis patient on the basis of PASI score: 64% patient had moderate to severe psoriasis and 36% had mild psoriasis. MPV is positively correlated with severity of psoriasis. MPV increases when disease severity increased. NLR and PLR had no significant correlation with disease severity.

Conclusion: MPV is a strong indicator of psoriasis severity. MPV and PLR should be followed up routinely to take preventive measures against psoriasis-related micro and macro vascular thrombotic complications.

Keywords: Psoriasis, MVP, PLR, Severity, NLR, PASI

Introduction

Psoriasis is a chronic inflammatory disease of the skin characterized by erythema, papules, and scales, which affects approximately 2% to 3% of the general population. [1] The disease mainly involves the skin; however, it is also associated with various comorbidities, such as arthritis, metabolic syndrome, and cardiovascular disease. [2] Psoriasis is a common chronic inflammatory skin disorder with a variable worldwide prevalence of up to 11.4% in adults and 1.4% in children. [3] Although the etiology and pathogenesis of psoriasis remain unclear, inflammation and immunity are involved in its development and progression. [4,5] Platelets, leukocyte, and endothelial cells interaction have been evaluated in the inflammatory process. [6] Increased keratinocyte proliferation and infiltration of T cells, macrophages, and neutrophils seem to be the main pathophysiology of psoriasis. [7]

It is also evidenced by histopathology of psoriatic lesions that a leukocyte infiltration is seen especially rich in T-lymphocytes and neutrophils. In psoriasis, reactive oxygen species causes the release of cytokines, proteases, and cationic proteins such as elastase and lactoferrin which ultimately activate neutrophils. It is characterized by leukocyte infiltration into the skin, which may arise from platelet activation and subsequent excessive cytokines and chemokines. [8,9] Platelet activation can be assessed by changes in platelet count and

volume, and mean platelet volume (MPV) and platelet distribution width (PDW) are good indicators of platelet size. [10] Platelet-to-lymphocyte ratio (PLR) has recently been introduced as a superior marker to monitor systemic inflammation, which has been shown to be higher in a multitude of inflammatory disorders. [11] An increased PLR may stem from an elevated platelet count (PLT), decreased lymphocyte number, or both.

Furthermore, MPV is of low cost, reliable, easy, and available parameter, estimated with automated hematology analyzer and also included in routine complete blood cell count (CBC). Platelet activation and aggregation are the basic processes in the pathophysiology of micro-and macrovascular (e.g. cerebrovascular, coronary, and peripheral arterial) disease. [12] Altered platelet morphology and function have been reported in psoriatic patients. Neutrophil lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) are the two new systemic inflammatory biomarkers. [13]

Therefore, in order to better understand the role played by different platelet-associated parameters in the development of psoriasis, a study was conducted to assess the frequency of platelet activation and leukocyte infiltration by measuring MPV, NLR, and PLR.

Material & Methods

A case-control observational study was conducted in the Department of Skin and VD at Narayan Medical Institute and Hospital, Saharsa, Bihar, India for the duration of 18 months. A total of 50 psoriasis cases and 50 healthy controls were included according to inclusion and exclusion criteria. Study populations are individuals diagnosed with psoriasis. The sample populations were extracted via purposive sampling. Individuals were screened on the basis of the inclusion and exclusion criteria of the study. Patients with psoriasis were diagnosed clinically and/or histopathologically by dermatologists attending the outpatient department of dermatology and venereology. Individuals who had apparently no physical complaints during history taking or presented the clinical finding of disease during my examination were selected as the control.

Methodology

The objective and procedure of the study were explained in both cases and controls in an easily understandable local language and then the respondents were signed in written consent form who felt interested to participate in my study. A detailed history and complete physical examination and necessary laboratory tests were carried out. Than 55% with psoriasis and 55 age, sex-matched healthy control who were free from known comorbid diseases was enrolled finally for this study according to the inclusion and exclusion criteria. Duration of disease was measured in years. The disease severity of each and every patient was measured by PASI. The score of PASI usually varies between 0 and 72. PASI score of less than or equal to 10 is classified as a mild disease, whilst a score of greater than 10 was considered to be moderate to severe. 2 cc of venous blood was drawn from each participant and sent to the main hematology department or clinical pathology, department of BSMMU for blood complete analysis by an autoanalyzer. Mean platelet volume was measured as a part of blood complete analysis and NLR, PLR also was calculated from the report.

Statistical Analysis

Statistical analysis was carried out by using the statistical package for the social sciences (SPSS) software version 23.0 for windows. Continuous data were expressed as the mean± standard-deviation (SD) and categorical variables were expressed as percentages. All data were processed with student's independent tests to compare between psoriatic and healthy individuals. Spearman correlation coefficient test was used to correlate MPV, NLR, and PLR with PASI. For all statistical tests, the p value is less than 0.05 was considered statistically significant.

Results

Table 1: Distribution of the study patients by age

Age in years	Case (n=50)		Control (n=50)	
	N	%	N	%
15-24	14	28	11	22
25-34	14	28	15	30
35-44	9	18	10	20
45-54	6	12	7	14
>55	7	14	7	14
Mean age±SD	35.25±12.48		32±14.26	
Range (years)	18-66		19-65	

Maximum patients were in between 15-34 years age group 56% in cases and 52% in control group. Age range of the cases and control was 18 to 66 years and 19 to 65 years respectively. The mean age of cases was 35.25±12.48 years and control was 32±14.26 years.

Table 2: Mean value of MPV, NLR, PLR in cases and control

Parameter	Case (mean±SD)	Control (mean±SD)
MPV	9.95±1.22	9.48±0.632
NLR	4.36±8.52	4.56±8.52
PLR	294.92±86.82	166.24±104.36

Mean±SD value of MPV, NLR and PLR in study cases was 9.95±1.22, 4.36±8.52 and 294.92±86.82 where as in case of control values were 9.48±0.632, 4.56±8.52, 166.24±104.36 respectively. Both the MPV and PLR means are high in case of psoriasis patient.

Table 3: Comparison of MPV, NLR and PLR in psoriasis and healthy control

Parameters	t value	P value
MPV	2.412	0.016
NLR	1.43	0.872
PLR	6.854	0.000

There was significant increase in MPV and PLR in psoriasis patient then healthy control group (p value was <0.05). NLR has not shown any significant difference in psoriasis and control group.

Table 4: Distribution of psoriasis patient group on basis of PASI score into mild and moderate to severe group

Severity of psoriasis	N	%
MILD	18	36
Moderate to severe	32	64
Total	50	100

The severity of psoriasis patient on the basis of PASI score: 64% patient had moderate to severe psoriasis and 36% had mild psoriasis.

Table 5: Severity correlation between MPV, NLR, and PLR with PASI by Spearman's correlation test

Parameter	Rho	P value
MPV	0.272	0.032
NLR	0.064	0.650
PLR	0.069	0.614

MPV is positively correlated with severity of psoriasis. MPV increases when disease severity increased. NLR and PLR had no significant correlation with disease severity.

Discussion

Increased keratinocyte proliferation and infiltration of T cells, macrophages, and neutrophils seem to be the main pathophysiology of psoriasis. [14] It is also evidenced by histopathology of psoriatic lesions that a leukocyte infiltration is seen especially rich in T-lymphocytes and neutrophils. Coimbra et al have studied peripheral blood of both psoriatic individual and control groups and found significantly increased levels of leukocyte, monocytes, and neutrophils and decreased levels of lymphocytes. [15] In psoriasis, reactive oxygen species causes the release of cytokines, proteases, and cationic proteins such as elastase and lactoferrin which ultimately activate neutrophils. However, thrombocytes also suggested to play an important role in the pathogenesis of psoriasis and the activation of thrombocytes ultimately increase leukocyte migration in the skin and release inflammatory cytokines. Evidence for an in vivo platelet activation, followed by thrombotic complication development has been established in a psoriasis patient. Activation of platelets can be done by various stimuli which are known to mediate the immune-inflammatory process. [16]

The platelet-related parameters that have been evaluated so far thus, include a PLR, CD-62, p-selectin, PDW, and MPV. MPV has attracted the most attention among these. NLR and PLR are the two novel inflammatory biomarkers used in the assessment of systemic inflammation. [17] For predicting inflammation and mortality, these markers are established to be used in many diseases. Recent studies show that a high PLR reflects inflammation, atherosclerosis, and platelet activation. [18] NLR may predict subclinical atherosclerosis in patients with psoriasis. [19] Maximum patients were in between 15-34 years age group 56% in cases and 52% in control group. Age range of the cases and control was 18 to 66 years and 19 to 65 years respectively. The mean age of cases was 35.25±12.48 years and control was 32±14.26

years. Mean±SD value of MPV, NLR and PLR in study cases was 9.95±1.22, 4.36±8.52 and 294.92±86.82 where as in case of control values were 9.48±0.632, 4.56±8.52, 166.24±104.36 respectively. Both the MPV and PLR means are high in case of psoriasis patient.

There was significant increase in MPV and PLR in psoriasis patient then healthy control group (p value was <0.05). NLR has not shown any significant difference in psoriasis and control group. The severity of psoriasis patient on the basis of PASI score: 64% patient had moderate to severe psoriasis and 36% had mild psoriasis. MPV is positively correlated with severity of psoriasis. MPV increases when disease severity increased. NLR and PLR had no significant correlation with disease severity. In a study done by Kim et al it was found that MPV is not only increased in psoriasis but also has a positive correlation with disease severity of psoriasis calculated by PASI score. [20] A total of one hundred and seventy-six (167) psoriasis patients and 101 healthy controls were observed in this study. In psoriasis patients, they observed that PASI, significantly correlated with MPV (r=0.189, p=0.006). Chandrasekar et al in their case-control study on 62 psoriasis patients along with age and sex-matched controls; found that MPV values were higher in patients as part of overall activation of platelets. [21] Karabudak et al in a study carried out on 20 patients with mild to moderate psoriasis, found significantly higher values for MPV in patients compared to controls. [22]

In marked contrast to our study, Saleh et al also failed to see any significant association between psoriasis and MPV in their study. [23] They also failed to find a link between psoriasis and MPV where the p value was 0.435. In our study, we have found NLR is not significantly raised in psoriasis patients in comparison to the control group. Ahmed et al also reported that MPV correlates significantly with the severity of the disease. [24] When the gender-based analysis was done no significant change in the overall study result found. Both male and female group shows significant MPV rises and it also correlated with disease severity. There are no significant NLR values in psoriasis but PLR shows significant elevation. Again PLR is not significantly increasing with disease severity.

Conclusion

In our present study, we have found MPV and PLR significantly high in psoriatic individuals in comparison to the control group. PASI score-based disease severity positively correlates with MPV values. The gender-based analysis does not alter any result. In conclusion, we suggest MPV is a strong indicator of psoriasis severity. MPV and PLR should be followed up routinely to take preventive measures against psoriasis-related micro and macrovascular thrombotic complications.

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