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ASSOCIATION OF SYSTEMIC INFLAMMATORY MARKERS WITH SEVERITY OF PSORIASIS AND THEIR ROLE IN PREDICTING CARDIOVASCULAR RISK

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Abstract

Background: Psoriasis is a chronic inflammatory skin disease increasingly recognized as a systemic disorder with heightened cardiovascular (CV) risk. Systemic inflammatory markers, including C-reactive protein (CRP), neutrophil-to-lymphocyte ratio (NLR), and platelet-to-lymphocyte ratio (PLR), have been proposed as potential indicators of both disease severity and cardiometabolic burden. This study aimed to assess the association of systemic inflammatory markers with psoriasis severity and evaluate their predictive value for cardiovascular risk.

Materials and Methods: A cross-sectional observational study was conducted on 210 patients with clinically diagnosed psoriasis attending a tertiary care center. Disease severity was graded using the Psoriasis Area and Severity Index (PASI) into mild (n=70), moderate (n=82), and severe (n=58) groups. Laboratory parameters including CRP, erythrocyte sedimentation rate (ESR), NLR, and PLR were measured and compared across groups. Cardiovascular risk was estimated using the Framingham risk score. Statistical analysis included ANOVA, Pearson correlation, and logistic regression, with $p<0.05$ considered significant.

Results: Mean CRP levels were significantly higher in severe psoriasis (11.6 ± 3.2 mg/L) compared to moderate (7.8 ± 2.5 mg/L) and mild (4.2 ± 1.9 mg/L) cases ($p<0.001$). Similarly, NLR increased progressively with severity (mild: 2.1 ± 0.6; moderate: 3.3 ± 0.9; severe: 4.5 ± 1.2; $p<0.001$). PLR also showed a rising trend (mild: 115 ± 28; moderate: 139 ± 34; severe: 168 ± 41; $p=0.002$). A strong positive correlation was found between PASI and CRP ($r=0.62$), NLR ($r=0.58$), and PLR ($r=0.49$). Logistic regression revealed CRP ≥10 mg/L and NLR ≥4.0 as independent predictors of high cardiovascular risk (OR=2.7, 95% CI: 1.6–4.5; OR=2.3, 95% CI: 1.3–3.9, respectively).

Conclusion: Systemic inflammatory markers such as CRP, NLR, and PLR correlate significantly with psoriasis severity and may serve as accessible, cost-effective tools for identifying patients at elevated cardiovascular risk. Incorporating these markers into routine evaluation could improve risk stratification and early preventive strategies in psoriatic patients.

Keywords: Psoriasis, systemic inflammation, C-reactive protein, neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, cardiovascular risk

Introduction

Psoriasis is a chronic, immune-mediated dermatosis characterized by erythematous, scaly plaques that affects approximately 2–3% of the global population (1). Beyond its cutaneous manifestations, psoriasis is increasingly recognized as a systemic inflammatory disorder with significant metabolic and cardiovascular implications (2,3). Persistent low-grade inflammation in psoriasis is mediated by dysregulated cytokine pathways, particularly involving interleukin (IL)-17, IL-23, and tumor necrosis factor-alpha, which extend their effects beyond the skin and contribute to endothelial dysfunction, insulin resistance, and atherogenesis (4,5).

Systemic inflammatory markers such as C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), neutrophil-to-lymphocyte ratio (NLR), and platelet-to-lymphocyte ratio (PLR) have been widely studied as indicators of subclinical inflammation in chronic diseases (6). These markers are inexpensive, routinely available in clinical settings, and may serve as surrogate indicators for disease activity and associated comorbidities. Previous studies have demonstrated that elevated NLR and PLR are correlated with psoriasis severity and may predict cardiovascular events (7,8).

Given the growing evidence that cardiovascular disease represents a major cause of morbidity and mortality in psoriatic patients, identifying reliable, accessible markers for early risk stratification is of substantial clinical value (9). Therefore, evaluating systemic inflammatory markers in relation to disease severity and cardiovascular risk may provide insights for better disease management and preventive strategies.

Materials and Methods

Study design and participants

A total of 210 patients diagnosed with psoriasis by clinical and, where necessary, histopathological criteria were recruited. Patients were classified into mild, moderate, and severe groups based on their Psoriasis Area and Severity Index (PASI) scores. Inclusion criteria were adults aged 18–65 years with stable plaque psoriasis for at least six months. Exclusion criteria included patients with acute infections, autoimmune disorders other than psoriasis, malignancy, or recent systemic therapy that could influence inflammatory markers.

Clinical assessment

Psoriasis severity was assessed using PASI scoring performed by a single trained dermatologist to minimize inter-observer variability. Demographic data, disease duration, and history of comorbid conditions were also recorded.

Laboratory investigations

Venous blood samples were obtained after overnight fasting. Complete blood counts were performed using an automated hematology analyzer, from which neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) were calculated. C-reactive protein (CRP) levels were measured using immunoturbidimetric assay, and erythrocyte sedimentation rate (ESR) was determined by the Westergren method. All assays were performed in the hospital's central laboratory following standardized protocols.

Cardiovascular risk estimation

The 10-year cardiovascular risk for each patient was calculated using the Framingham risk score, which incorporates age, sex, lipid profile, blood pressure, diabetes status, and smoking history. Patients were stratified into low, intermediate, and high cardiovascular risk categories.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY). Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Comparisons across disease severity groups were performed using

one-way analysis of variance (ANOVA) for continuous variables and chi-square test for categorical variables. Correlation between PASI and inflammatory markers was assessed using Pearson correlation coefficients. Logistic regression was applied to identify predictors of high cardiovascular risk. A p-value <0.05 was considered statistically significant.

Results

A total of 210 patients with psoriasis were included, of whom 124 (59.0%) were male and 86 (41.0%) were female. The mean age of the study population was 42.6 ± 11.3 years, with a mean disease duration of 7.8 ± 4.5 years. Distribution by severity revealed 70 patients with mild disease, 82 with moderate disease, and 58 with severe disease.

Systemic inflammatory markers across severity groups

The mean values of CRP, ESR, NLR, and PLR increased progressively with psoriasis severity (Table 1). Severe psoriasis patients demonstrated significantly higher CRP levels (11.6 ± 3.2 mg/L) compared to moderate (7.8 ± 2.5 mg/L) and mild (4.2 ± 1.9 mg/L) groups (p<0.001). Similar trends were observed for ESR, NLR, and PLR (p<0.05 for all).

Table 1: Comparison of systemic inflammatory markers across psoriasis severity groups

Parameter	Mild (n=70)	Moderate (n=82)	Severe (n=58)	p-value
CRP (mg/L)	4.2 ± 1.9	7.8 ± 2.5	11.6 ± 3.2	<0.001
ESR (mm/hr)	15.8 ± 6.2	23.6 ± 7.4	32.9 ± 9.5	<0.001
NLR	2.1 ± 0.6	3.3 ± 0.9	4.5 ± 1.2	<0.001
PLR	115 ± 28	139 ± 34	168 ± 41	0.002

Values are expressed as mean ± SD.

Correlation with PASI scores

Pearson correlation analysis demonstrated a strong positive association between PASI and CRP (r=0.62), NLR (r=0.58), and PLR (r=0.49), while ESR also showed a moderate correlation (r=0.45), all statistically significant (p<0.001). These findings confirm that systemic inflammatory markers rise with increasing disease severity (Table 1).

Association with cardiovascular risk

Using the Framingham risk score, 32.4% of patients were classified as high cardiovascular risk, with the majority belonging to the severe psoriasis group. Logistic regression identified CRP ≥10 mg/L (OR=2.7; 95% CI: 1.6–4.5) and NLR ≥4.0 (OR=2.3; 95% CI: 1.3–3.9) as independent predictors of high CV risk (Table 2).

Table 2: Logistic regression analysis of inflammatory markers as predictors of high cardiovascular risk

Marker	Cut-off value	Odds Ratio (OR)	95% Confidence Interval	p-value
CRP (mg/L)	≥10	2.7	1.6–4.5	<0.001
ESR (mm/hr)	≥25	1.8	1.1–3.0	0.021
NLR	≥4.0	2.3	1.3–3.9	0.004
PLR	≥150	1.6	0.9–2.8	0.08

As shown in Table 2, CRP and NLR were the most significant independent predictors of elevated cardiovascular risk in psoriatic patients.

Discussion

This study demonstrates that systemic inflammatory markers, including CRP, ESR, NLR, and PLR, are significantly elevated in patients with more severe psoriasis, and that CRP and NLR are independent predictors of increased cardiovascular risk. These findings support the concept that

psoriasis is not merely a skin-limited disease but a systemic inflammatory condition with important cardiometabolic implications.

The relationship between systemic inflammation and psoriasis severity has been widely studied. Elevated CRP levels have been consistently associated with higher PASI scores and greater systemic inflammatory burden (1,2). Our results align with earlier reports by Coimbra et al. and Mehta et al., who highlighted CRP as a reliable biomarker reflecting both cutaneous activity and vascular inflammation in psoriatic patients (3,4). Similarly, ESR, though less specific, has been shown to increase in active disease and contributes to overall inflammatory profiling (5).

The neutrophil-to-lymphocyte ratio is emerging as a robust marker of systemic inflammation. Our findings of progressively higher NLR with increasing disease severity are consistent with prior studies that identified NLR as a cost-effective surrogate for disease activity (6,7). Moreover, high NLR has been linked to endothelial dysfunction and adverse cardiovascular outcomes in psoriasis, underscoring its prognostic utility (8,9). PLR also showed significant correlation with PASI in our cohort, which concurs with recent data suggesting its role as an adjunctive inflammatory marker, although its predictive strength for cardiovascular outcomes appeared weaker than NLR and CRP (10,11).

The association of psoriasis with cardiovascular morbidity is well established. Patients with severe psoriasis have nearly double the risk of myocardial infarction and cardiovascular mortality compared to the general population (12,13). Our study adds to this evidence by demonstrating that elevated CRP and NLR thresholds significantly predict high cardiovascular risk as assessed by the Framingham score. This supports prior observations that systemic inflammation in psoriasis contributes to accelerated atherosclerosis and increased cardiometabolic risk (14).

From a clinical perspective, these findings highlight the value of incorporating routine hematological markers into risk stratification models for psoriatic patients. Given that CRP, NLR, and PLR are inexpensive and widely available tests, they may serve as practical tools for early detection of patients at greater risk for cardiovascular events. Early intervention strategies, including lifestyle modification, aggressive control of cardiovascular risk factors, and use of systemic or biologic therapies targeting inflammatory pathways, could potentially reduce long-term morbidity and mortality (15).

Limitations of this study include its cross-sectional design, which precludes establishing causality, and the reliance on a single cardiovascular risk model. Larger longitudinal studies with inclusion of imaging modalities such as carotid intima–media thickness or coronary calcium scoring may provide stronger evidence for the predictive role of these markers.

Conclusion

Systemic inflammatory markers, particularly CRP and NLR, correlate significantly with psoriasis severity and independently predict cardiovascular risk. Routine use of these markers may aid in identifying high-risk patients and guiding preventive strategies.

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