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Original Research Article

Correlation of Haematological Indices with Disease Severity in Patients of Chronic Plaque Psoriasis

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Abstract

Introduction: Psoriasis vulgaris is a chronic inflammatory disorder and while exact pathogenesis of the disease has not been established, genetic and immunological mechanisms are presumed to play an important role. Platelets are known to play important roles in inflammatory reactions and immune responses and can be activated by various stimuli. Besides platelet count, one of the parameters that act as an important indicator of platelet activation is mean platelet volume [MPV]. The relationship between severity of psoriasis and MPV has been a subject of investigation in recent studies.

Aim: To assess the relationship between hematological parameters for platelet activation like platelet count, MPV and red cell distribution width (RDW) with the disease severity indices of psoriasis vulgaris such as Psoriasis area severity index (PASI) and Nail psoriasis severity index (NAPSI).

Materials and Methods: A case control study was conducted on 124 psoriatic patients and 124 healthy controls. The haematologic parameters (Haemoglobin, total leucocyte count, platelet count, MPV, RDW) were compared between patients and control subjects. These parameters were also correlated in patients with the PASI and NAPSI score. The data was statistically analysed using IBM SPSS software (Version 21). Spearman Rank Correlation was used to find the correlation between PASI/NAPSI and various haematological parameters. A receiver operating characteristic (ROC) curve was plotted to determine cutoff value of MPV.

Results: PASI showed a negative correlation with MPV ($p = 0.023$) and when both genders were compared, a highly significant negative correlation was seen among the male patients ($p = 0.007$). A statistically significant negative correlation was noted with RDW and PASI ($p = 0.042$) whereas NAPSI and platelet count showed a significant positive correlation ($p = 0.035$). However, neither of these 2 parameters showed a significant difference when evaluated on basis of gender. ROC curve cut off value for MPV was ≥ 8 with a sensitivity of 87% and specificity of 62%.

Conclusion: The MPV values and RDW showed negative correlation with the PASI score (highly significant with MPV in male patients). NAPSI showed a significant positive correlation with platelet count. It can be concluded that decreasing MPV and decreasing RDW could be regarded as indicators of severe disease. Due to small sample size of our study and lack of previous research, further studies may be necessary before drawing conclusive evidence for the relationship of NAPSI with these parameters.

Keywords: Psoriasis vulgaris, Mean platelet volume, Platelet count, platelet activation

Introduction

Psoriasis vulgaris is a chronic inflammatory disorder with a prevalence ranging from 0.91-8.5% in the adult population. It can occur at all ages although it is most commonly seen between the ages of 50-70 years. It is characterized by a long clinical course punctuated by periods of attacks and remissions. Psoriasis can affect the skin, scalp, nails, as well as the skeletal system [1, 2].

Although the exact pathogenesis of the disease has not been established, genetic and immunological mechanisms are presumed to play an important role. It was found that T-cells, particularly those with Th1 and Th17 polarization, are heavily present in psoriatic lesions [3].

Platelets are known to play important roles in inflammatory reactions and immune responses. Platelets can be activated by various stimuli, and its activity is known to mediate the immune-inflammatory process. Besides platelet count, one of the parameters that act as an important indicator of platelet activation is mean platelet volume [MPV]. The relationship between severity of psoriasis and MPV has been a subject of investigation in recent studies. As platelet count and MPV can be easily measured by an automated hemolyzer, it has the added benefit of being a cost-effective way to measure platelet activation [3-6].

Aim

We undertook this study to assess the relationship between hematological parameters for platelet activation like platelet count, MPV and red cell distribution width with the disease severity indices of psoriasis vulgaris such as Psoriasis area severity index (PASI) and Nail psoriasis severity index (NAPSI).

Material and Methods

This case control study was carried out at a tertiary care hospital in Rajasthan, India over duration of 1 year from 1st January 2019 to 31st December 2019. Due to a limited number of patients and low prevalence of the disease, all patients falling under inclusion criteria were approached for the study. All patients more than 18 years of age diagnosed with psoriasis vulgaris having active disease at the time of assessment were included in the study.

Written informed consent was taken from all the participants. Patients with other chronic inflammatory diseases such as rheumatoid arthritis, inflammatory bowel disease, cardiovascular disorders, haematological disorders, carcinomas, chronic liver or kidney diseases, pregnant and lactating women and patients undergoing or having history of radiation or chemotherapy were excluded from this study. 124 patients and 124 healthy controls were included in this study. The demographic data of the participants, clinical details, PASI, NAPSI and laboratory parameters were noted.

PASI was calculated using: [7]

PASI = [0.1 (eH + iH + dH) AH] + [0.2 (eU + iU + dU) AU] + [0.3 (eT + iT+ dT) AT] + [0.4 (eL + iL + dL) AL]

Where erythema (e), induration (i), desquamation (d), area affected (A), head and face (H), upper limb (U), trunk (T) and lower limbs (L). There severity of erythema, induration and desquamation was graded as 0 = nil, 1 = mild, 2 = moderate, 3 = severe or 4 = very severe. The percentage area involvement of the each site was graded as: 1 = <10%, 2 = 10-29%, 3 = 30-49%, 4 = 50-69%, 5 = 70-89%, 6 = area > 90%.

For estimation of NAPSI [8], the affected nail was divided into four quadrants and the presence of lesions of the nail matrix (M) and nail bed (B) are given a score of 1 in each quadrant. Lesions which involved the nail matrix were pitting, leukonychia, red spots in the lunula, nail plate crumbling and lesions involving nail bed were onycholysis, splinter hemorrhages, subungual hyperkeratosis, oil spot/salmon patch. The score of each nail can range from a minimum of 0 to a maximum of 8, and the total score can range from 0 to 80.

Ethical clearance was obtained from the institutional review committee prior to initiation of the study.

Statistical analysis

All data obtained was recorded and analysed using IBM SPSS software (version 21) and the mean, standard deviation, frequencies and percentages were used for the descriptive data. Spearman rank correlation was used to assess the correlation between PASI and NAPSI with various haematological parameters. p value of <0.05 was deemed to be statistically significant and <0.01 was highly significant.

Results

Table 1

Parameter	Mean ± SD (n = 124) in patients	Mean ± SD (n = 124) in controls	P value
Mean age (in years)	40.93 ± 14.82	42.83 ± 12.92	0.28
Mean age of onset of disease (in years)	33.77 ± 15.25	-	
Mean duration of disease (in years)	7.14 ± 7.32	-	
Mean PASI	8.84 ± 6.16	-	
Mean NAPSI	18.63 ± 18.33	-	
Mean MPV	8.99 ± 1.46	8.69 ± 1.47	0.11
Mean Platelet count	284.47 ± 68.73	307.28 ± 71.06	0.01
Mean RDW	14.44 ± 2.62	12.39 ± 1.52	<0.0001
Mean Hb	13.34 ± 1.88	13.24 ± 1.63	0.65
Mean TLC	7.68 ± 1.87	8.35 ± 1.99	0.006

Table 2: Spearman Rank correlation between PASI and haematological factors

		Haemoglobin	TLC	Platelet count	MPV	RDW
PASI ALL	rho	0.238**	-0.018	0.089	-0.204*	-0.183*
	p	0.008	0.846	0.326	0.023	0.042
PASI F	rho	0.142	0.009	0.142	0.143	-0.263
	p	0.397	0.958	0.395	0.392	0.11
PASI M	rho	0.151	0.044	0.047	-0.291**	-0.165
	p	0.165	0.685	0.671	0.007	0.130

Table 3: Spearman Rank correlation between NAPSI and haematological factors

		Haemoglobin	TLC	Platelet count	MPV	RDW
NAPSI ALL	rho	0.138	-0.175	0.189*	-0.160	0.023
	p	0.126	0.052	0.035	0.076	0.801
NAPSI F	rho	0.103	-0.163	0.277	-0.036	-0.012
	p	0.538	0.134	0.092	0.830	0.941
NAPSI M	rho	-0.60	0.163	0.133	-0.150	0.013
	p	0.581	0.134	0.222	0.167	0.908

Table 4: Comparison of demographic data and haematological parameters in patients with mild psoriasis vs. moderate to severe psoriasis.

Characteristics	PASI ≤10 (n=82)	PASI >10 (n=42)	P value
Sex (M/F)	54 / 28	32 / 10	
	Mean ± SD		
Age	38.80 ± 15.01	45.07 ± 13.68	0.025*
Haemoglobin	13.02 ± 1.98	13.95 ± 1.48	0.008*
Total Leukocycte count	7.58 ± 1.87	7.88 ± 1.89	0.401
Platelet count	285.20 ± 98.88	283.05 ± 56.97	0.896
MPV	9.17 ± 1.51	8.63 ± 1.31	0.051*
RDW	5.22 ± 2.56	13.56 ± 2.06	<0.001*

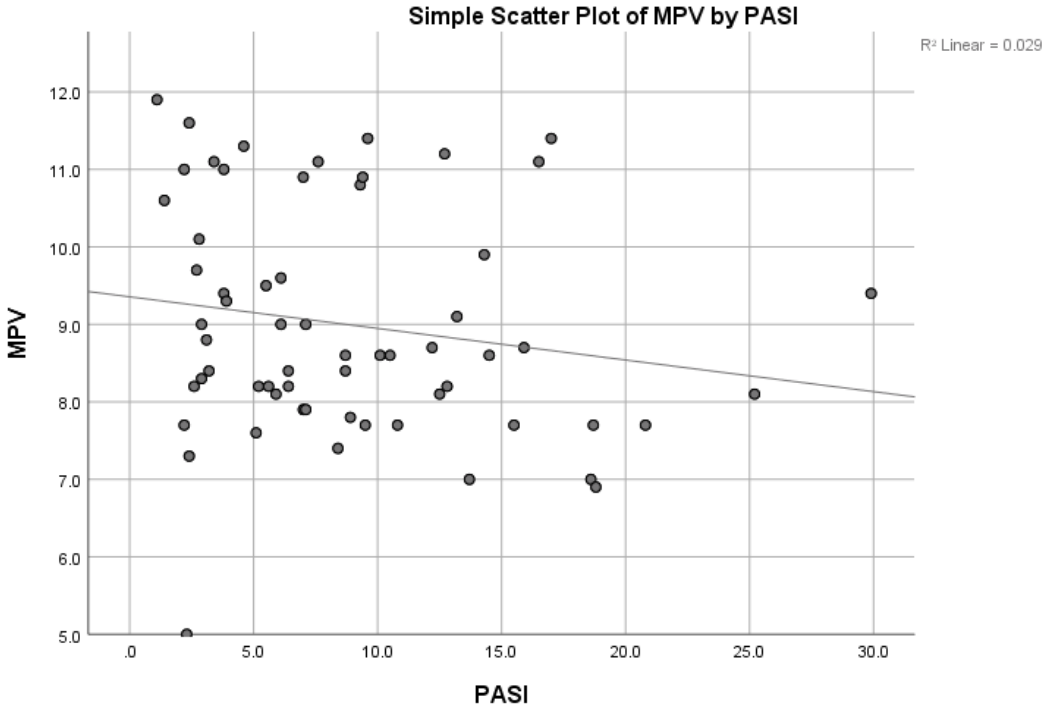

Figure 1: Scatter plot of MPV by PASI

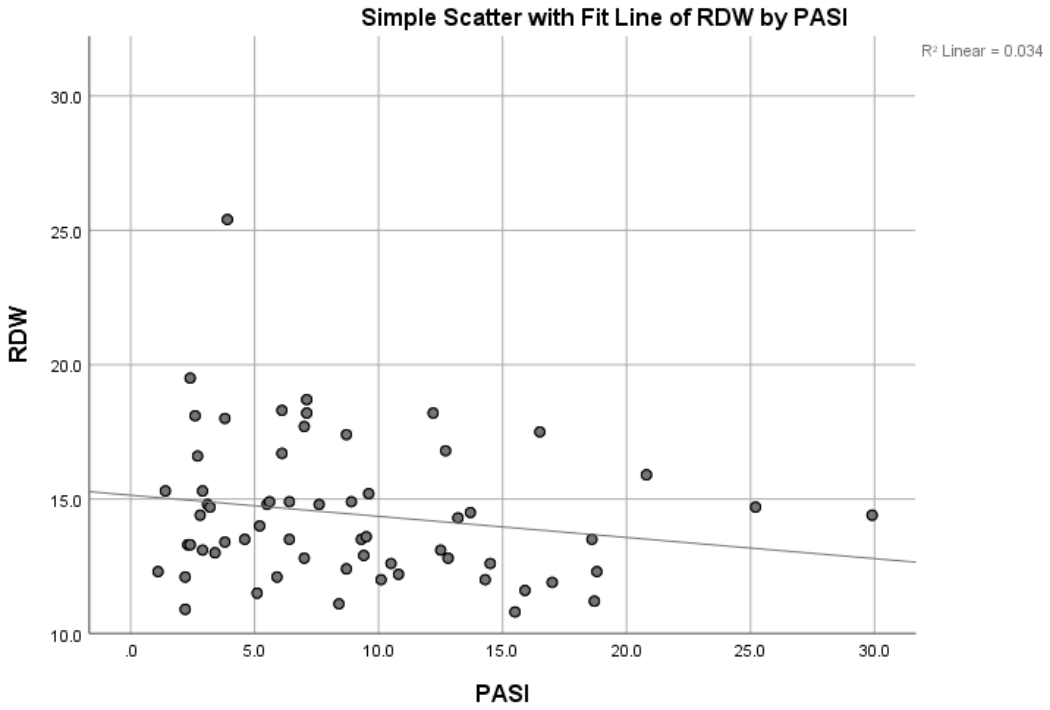

Figure 2: Scatter plots of RDW by PASI.

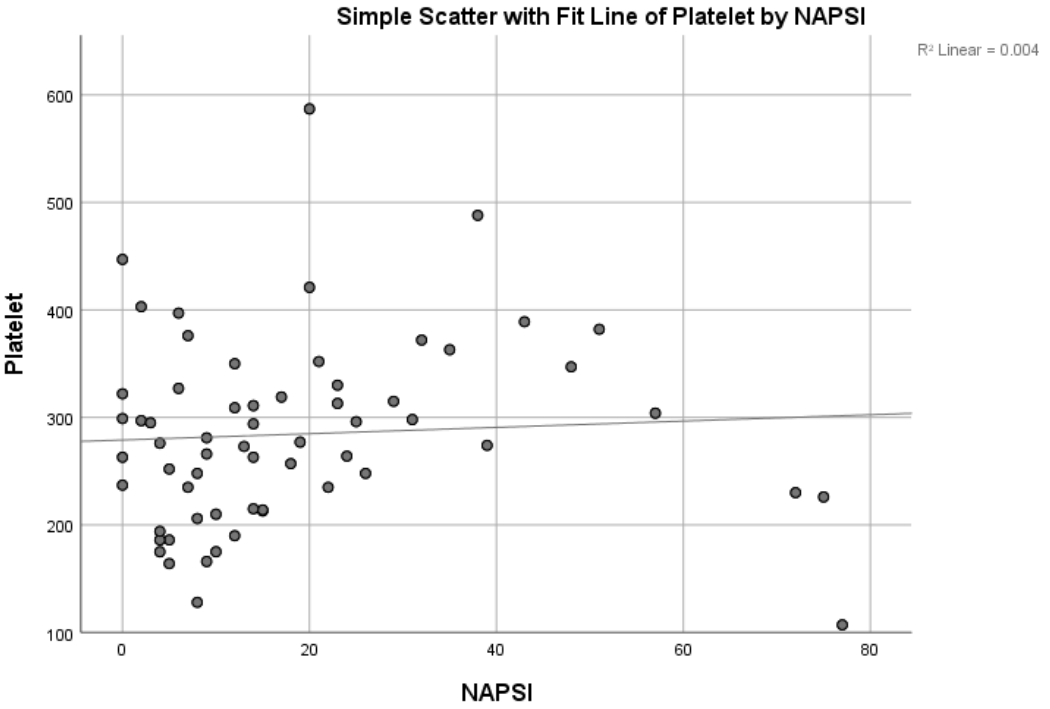

Figure 3: Scatter plot of platelet count by NAPSI

124 psoriasis patients and 124 healthy controls were included in our study. The demographic and laboratory characteristics are shown in Table 1. When all the subjects

of the study were assessed, the mean values for red cell distribution width (RDW), platelet count (PLT) and total leukocyte count (TLC) showed significant difference between the control subjects and the patients. The mean, standard deviation (SD) and the p-values of haematological parameters in the patients as well as controls are given in the Table 1.

On conducting a gender-based analysis for the correlation of PASI with the above parameters, the only difference observed differences was with MPV, which was highly significant in males. (Table 2) On carrying out a similar analysis of NAPSI with the haematological parameters no significant difference was seen between male and female patients. (Table 3)

Overall PASI showed a negative correlation with MPV which was statistically significant. (p value = 0.023) (Figure 1)

PASI also showed a statistically significant negative correlation with RDW. (p value = 0.042) (Figure 2)

NAPSI showed a statistically significant correlation with platelet count. (p value = 0.035) (Figure 3)

The patients were divided into two groups based on PASI i.e. mild psoriasis (PASI

≤10) and moderate to severe psoriasis (PASI > 10) and the demographic and

laboratory parameters between the two groups were compared. A statistically significant difference was noted in the values of hemoglobin (Hb), MPV and RDW (Table 4)

A receiver operating characteristic (ROC) curve was plotted to determine cutoff value of MPV and the value of ≥ 8 (sensitivity – 87%, specificity 62%) was regarded as the best cutoff point to differentiate between subjects with altered platelet characteristics from patients without any significant changes in platelet characteristics. A statistically significant difference was found between case and control group on ROC analysis.

Discussion

Psoriasis is a chronic inflammatory skin disorder that may also involve the nails and the skeletal system. It is a T-cell mediated disease that is influenced by various environmental and genetic factors. Various pro-inflammatory cytokines are responsible for the initiation of psoriasis [1]. However, none of these mediators have proved to be reliable markers for the disease severity [2].

In an attempt to combat this, recent studies conducted on inflammatory disorders have given importance to the role of platelets [1,2,4-6]. Platelets are responsible for endothelial adhesion and aggregation that mediates hemostasis. They also influence the regulation of inflammatory processes [9]. MPV is an important indicator of platelet activation and function which has been used as an inflammatory marker in various disorders.

Canpolat F *et al* [5] conducted a study on 106 patients of psoriasis, and found that MPV levels were increased in patients with psoriasis and psoriatic arthritis when compared to healthy controls. These findings were concordant with studies conducted by Raghavan V *et al*, [2] Kim DS *et al* [6] and Kilic S *et al*; [1] all of which detected a statistically significant correlation between MPV and PASI.

However, is noteworthy that Saleh HM *et al* [10] conducted a similar study and reported no significant correlation between PASI and MPV. This may be attributed to the fact that the study was conducted on just 25 patients and 25 controls. In our study, we observed a significant negative correlation between PASI and MPV with a p value of 0.023. This finding is contradictory to the majority of the studies mentioned above. Gender based analysis of MPV with PASI revealed a highly significant negative correlation with MPV in

males (rho = - 0.291, p value = 0.007) but no significant correlation in females. This is similar to Raghavan V *et al* 2 whose study also revealed that the change in MPV was statistically significant only in males. MPV should be calculated within 1 hour of sample collection for proper assessment, however as we are setup in a medical college, due to a high load of patients we cannot guarantee that the test would have been carried out in the correct time frame from collection. To combat this issue, we also did ROC analysis of MPV value of both case and control group. ROC cutoff value was identified as 8 with a sensitivity of 87% and specificity of 62%. Based on MPV values, this shows an inflammatory tone of significance in the case group.

The patients of the study were divided into two groups on the basis of PASI. Patients belonging to group with PASI <10 were classified as mild psoriasis and PASI >10 was moderate to severe psoriasis. The group of mild psoriasis comprised of 82 patients whereas the moderate to severe psoriasis group had 42 patients. Comparison between the mean MPV of both these groups revealed a significantly higher MPV value in patients with mild psoriasis (p value = 0.05). Kim DS *et al* [6] also found a significant difference between MPV of both groups.

A negative correlation was also seen between PASI and RDW with a p value of 0.042 in the present study. This is consistent with the findings of Raghavan V *et al* [2].

However, this correlation did not persist when males and females were analysed individually. The mean RDW (p value <0.0001) was significantly higher in patients belonging to the group with moderate to severe psoriasis when compared to the group with mild psoriasis.

RDW is known to have a statistically significant negative correlation with haemoglobin11, and patients with moderate to severe psoriasis are more prone to having anemia of chronic disease, which might explain why RDW was higher in group of patients with PASI >10.

In the present study, a highly significant correlation between PASI and haemoglobin (rho = 0.238, p = 0.008) was seen. Previous studies conducted by Kim DS *et al* [6] and Raghavan V *et al* [2] failed to find a significant correlation between PASI and haemoglobin and are contradictory to our study. A statistically significant difference in the haemoglobin was observed in patients with mild psoriasis versus those with moderate to severe psoriasis. Although we expect anemia of chronic disease in psoriatic patients, our study has a contradictory finding.

Analysis of NAPSI with all above haematological parameters revealed a significant correlation only with platelet count (rho = 0.189, p value = 0.035). Haemoglobin, TLC, MPV, RDW revealed no significant correlation with NAPSI. Gender based analysis did not reveal any significant difference. To the best of our literature search, there are no previous studies researching the correlation between NAPSI and mediators of inflammation/ platelet activation. Hence, we do not have any significant data to compare our results to. The correlation between NAPSI and platelet count is an incidental and paradoxical finding as we were unable to find any correlation of PASI with platelet count. The data from this study is not significant to draw a conclusive hypothesis and necessitates further research.

Previous studies have indicated that MPV level can be affected by lifestyle, diet and diseases such as acute myocardial infarction (MI), hypercholesterolemia, diabetes mellitus, hypertension. It is important to note that patients with psoriasis are more prone to obesity, hypercholesterolemia, diabetes mellitus, hypertension, cardiovascular risk etc. The level of MPV may have a role in increased platelet activation. For this reason,

we believe that MPV levels may be used as an informative parameter to aid in the assessment of an inflammatory condition such as psoriasis. [1]

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