Association Between Mean Platelet Volume And Disease Activity In Patients With Psoriatic Arthritis

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ABSTRACT:

Background: Mean platelet volume is an important marker that shows the activation and function of the platelet which is effective in the inflammatory process.
Aim of the study: To show the relationship between mean platelet volume and disease activity score in psoriatic arthritis patients (PsA).
Methods: a cross-sectional study was done. A total of 90 patients participated in the study. The sample was collected over 6 months. Mean platelet volume was measured and correlated with disease activity score, and the relation between mean platelet volume with other disease activity markers like erythrocyte sedimentation rate (ESR) and C-reactive proteins (CRP)was determined. The serum of (cholesterol, tri-glycerides, low density lipoproteins, and high density lipoproteins) were estimated and correlated with DAPSA scores.
Results: The mean (SD) of MPV was 10.4fl .It is evident in Psoriatic arthritis patients that around two thirds (64.9%) of patients were with high MPV and 39.4% of patients were with normal MPV. There is statistically significant positive correlation between the MPV and the DAPSA score, and the positive significant correlation between disease activity score with ESR, and CRP. Also, there was a positive correlation between s. cholesterol, s. triglyceride, LDL and DAPSA score while a negative significant correlation was found between DAPSA score and HDL.
Conclusion: Higher disease activity in PsA patients is associated with correspondingly high MPV and high level of inflammatory markers like ESR and CRP, and lipid profiles.

Keywords: Psoriatic arthritis, Disease activity, Mean platelet volume. cholesterol.

الارتباط بين متوسط حجم الصفائح الدموية ونشاط المرض لدى مرضى التهاب المفاصل الصدفي

الملخص:
الخلفية: متوسط حجم الصفائح الدموية هو علامة مهمة تظهر خلال تنشيط وظيفة الصفائح الدموية وهي فعالة في عملية الالتهاب.
الهدف من الدراسة: إظهار العلاقة بين متوسط حجم الصفائح الدموية ودرجة نشاط المرض لدى مرضى التهاب المفاصل الصدفي (PsA).
الطرق: تم عمل دراسة مقطعية. شارك في الدراسة 90 مريضا. تم جمع العينة على مدى 6 أشهر. تم قياس متوسط حجم الصفائح الدموية وربطها بنتيجة نشاط المرض ، وتم تحديد العلاقة بين متوسط حجم الصفائح الدموية مع مؤشرات نشاط المرض الأخرى مثل معدل ترسيب كرات الدم الحمراء (ESR) والبروتينات المتفاعلة(CRP) . تم تقدير مصل (الكوليسترول ، ثلاثي الجليسريدات ، البروتينات الدهنية منخفضة الكثافة ، والبروتينات الدهنية عالية الكثافة) وربطها بنتائجDAPSA .
النتائج: كان متوسط (SD) لـ MPV هو 10.4 fl ، ومن الواضح في مرضى التهاب مفاصل الصدفي أن حوالي ثلثي (64.9٪) من المرضى كانوا يعانون من MPV عالي و 39.4٪ من المرضى نسبة MPV كانت طبيعية. هناك علاقة إيجابية ذات دلالة إحصائية بين MPV ودرجة DAPSA ، والعلاقة الإيجابية ذات الدلالة بين درجة نشاط المرض مع ESR و CRP أيضا ، كان هناك ارتباط إيجابي بين مصل (الكولسترول ، الدهون الثلاثية ، LDL) معDAPSA ، بينما تم العثور على إرتباط سلبي بين درجة DAPSA وHDL .

الاستنتاجات : يرتبط نشاط المرض العالي في مرضى PsA مع MPV المرتفع المقابل ومستوى عالٍ من علامات الالتهاب مثل ESR و CRP ، وملامح الدهون.

الكلمات المفتاحية: التهاب المفاصل الصدفي ، نشاط المرض ، متوسط حجم الصفائح الدموية، الكولسترول.

INTRODUCTION:

Psoriatic arthritis (PsA) is a long lasting inflammatory arthritis which is a member of the spondyloarthropathy family that affects the spine and nearby peripheral joints. It is related to psoriasis and commonly has negative serology for rheumatoid factor (1). It is one of the three most common forms of arthritis in which both genetics and the environmental causes play a role (2). There has been a link between individuals who have psoriatic spondylitis and a definite gene marker, in that 50% of individuals who has PsA of the spine HLA-B27 is present (3). Men and women are affected similarly and characteristically the age onset is between 30 to 50 years (4). PsA is also associated with a number of metabolic co-morbidities, including cardiovascular disease, diabetes, dyslipidaemias and obesity (5). Psoriasis is an inflammatory skin condition presents with a red scaly rash on the extensor surface and associated with nail changes, up to one-third of patients with psoriasis may develop inflammatory arthritis (6).

The mean platelet volume (MPV) is a measurement of the average size of platelets found in the blood (7).There is an increase in the level of MPV in destructive thrombocytopenia and low MPV levels in hypo proliferative thrombocytopenia (8). MPV is calculated by haematological analyzer on the basis of volume distribution during routine blood morphology test, the normal range is between (7.5- 12.0)fL (9). Larger platelets are metabolically and enzymatically more active and have higher thrombotic potential and higher expression of platelet surface activation markers (10). In patients with constant inflammation, the increasing concentration of pro-inflammatory cytokines, mainly IL-6, can cause platelet release. This is associated with the encouragement of thrombopoietin generation by IL-6 and a direct effect of this cytokine on megakaryocytes can cause an increase in the ploidy of megakaryocytic nuclei and an increase in cytoplasm volume which result in production of a huge number of blood platelets (9).The inflammatory indicators erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) may not always correlate with the disease activity, thus a new indicator "MPV" may be helpful in assessing the sequence of the diseases (11). A predictor of increased cardio vascular disease is elevated MPV(12).

In PsA, patients had a higher incidence of modifiable risk factors for cardiovascular disease (CVD), such as hyperlipidaemia and obesity (10). In PsA active peripheral arthritis is related to elevate levels of total cholesterol (TC),total tri-glyceride(TG),and low density lipoprotein(LDL)due to the significant correlation between hyperlipidaemia, obesity, and PsA(10). Since there are little information regarding mean platelet volume that have an impact on the immune system, this work is crucial to identifying this connection particularly in severe instances of psoriatic arthritis(13)..

AIM OF THE STUDY

This study aimed to estimate mean platelet volume in psoriatic arthritis patients.

MATERIAL AND METHODS:

A cross-sectional study was done. This study was conducted at the outpatient clinic of rheumatology unit, Rizgary teaching hospital, Erbil city, Kurdistan. Over 6 months from November 2021 to April 2022.

Sample collection:

A study included 90 patients of psoriatic arthritis by a (non-random) sampling technique and according to the 1987 revised American college of rheumatology (ACR) classification criteria for diagnosis of PsA (1).

Inclusion criteria The study includes 90 cases of previously diagnosed psoriatic arthritis, age group from (21-75) years, male and female included.

2.4 Exclusion Criteria The conditions that affects the mean platelet volume were excluded such as:

- Age less than 21 years.
- Smoking and alcohol
- Diabetes mellitus
- Systolic or diastolic hypertension
- Ischemic heart disease
- Thyroid disease
- Cancer patients
- Chronic obstructive pulmonary disease
- Primary biliary cirrhosis.
- Non-alcoholic fatty liver disease NAFLD
- Pregnant women
- BMI more than 35
- Those on oral contraceptive pill (OCP)
- Those on anti-platelet drugs like clopidogrel (Plavix)

Informed verbal consent was obtained from each patient. After that individual interview was done and all PsA patients answered the questions through a special designed questionnaire which included (age, gender, marital state, occupation, body mass index (BMI), history of smoking alcohol, duration of PsA, family history of PsA, DAPSA scoring, comorbidities, investigations, current drug uses). Examination for peripheral and axial skeleton was performed. All entheseal sites were examined for tenderness and swelling include (tens elbow, golfer elbow, dequervain, Achilles tendinitis, planter fasciitis). In addition, ductility's of hand and foot, and the extent of psoriasis, nail changes (nail pitting, onycholysis, oil spots) and eye complain are also examined.

Disease activity score (DAPSA):

The activity of psoriatic arthritis was assessed by DAPSA score, the PsA patients are graded into four categories (remission from 0-4, low grade 5-14, moderate grade 15-28 and high disease activity more than 28). DAPSA score calculated by a parameter consists of (tender joint +swelling joint + CRP +Activity +Pain).

Biological Markers measurement

10 ml of venous blood was collected from all patients using plastic disposable syringes. By VACUTAINER, the analysis was performed in Rizgary teaching hospitals laboratory unit. 5cc of blood sample were used for CBC which include MPV, ESR, CRP, and another 5cc of remaining blood after 12 hours fasting used for lipid profile.

STATISTICAL ANALYSIS:

Data were analysed using the Statistical Package for Social Sciences (SPSS, version 25). Numerical variables were presented in form of means and standard deviations (SDs). Categorical variables were presented in form of frequencies and percentages. Chi square test of association was used to compare proportions. Spearman rho correlation coefficient was calculated to assess the strength of correlation. A p value of ≤ 0.05 was considered as statistically significant.

RESULTS

Ninety patients with psoriatic arthritis (PsA) were included in the study. Their mean age (SD) was 44.4 (12.9) years, the median was 43.5 years, and the age range was 21 to 75 years. Table 1 presents the age distribution, and shows also that 63.3% of the sample were females and 36.7% were male. The majority (81.1%) of the patients were married. The table shows that 47.8% were employed, and 47.8% were unemployed. Half of the sample had family history of rheumatoid disease, and the duration of the disease was less than five years

in 53.3% of the patients. Finally, the table shows that 54.4% of the patients were overweight, and 15.6% were obese (Table 1).

Table 1. Basic characteristics.

	No.	(%)
Age (years)		
< 30	12	(13.3)
30-39	19	(21.1)
40-49	29	(32.2)
50-59	17	(18.9)
≥ 60	13	(14.4)
Mean (SD)	44.4	(12.9)
Gender		
Male	33	(36.7)
Female	57	(63.3)
Marital status		
Single	17	(18.9)
Married	73	(81.1)
Occupation		
Employed	43	(47.8)
Unemployed	43	(47.8)
Retired	4	(4.4)
Family history of rheumatoid disease		
Positive	45	(50.0)
Negative	45	(50.0)
Duration of psoriatic arthritis (years)		
< 5	48	(53.3)
5-9	26	(28.9)
≥ 10	16	(17.8)
Body mass index (Kg/m^2)		
Normal (< 25)	27	(30.0)
Overweight (25-29.9)	49	(54.4)
Obese (≥ 30)	14	(15.6)
Total	90	(100.0)

The level of the mean platelet volume (MPV) was 10.43 ± 1.48fL. As presented in Table 2. The table presents also the descriptive statistics of the lipid profile of the patients (Table 2).

Table 2. Means of mean platelet volume, and lipid profile.

	Mean	(SD)	Min.	Max.
Mean platelet volume (FL)	10.43	(1.48)	7.50	13.00
S. Cholesterol (mg/dl)	170.04	(73.18)	49.00	400.00
TG (mg/dl)	127.32	(81.54)	48.00	542.00
LDL (mg/dl)	74.71	(32.95)	24.00	159.00
HDL (mg/dl)	52.385	(13.99)	28.00	89.00

the present study showed that prevalence of high mean platelets volume (MPV) was 63.3% as shown in figure-1.

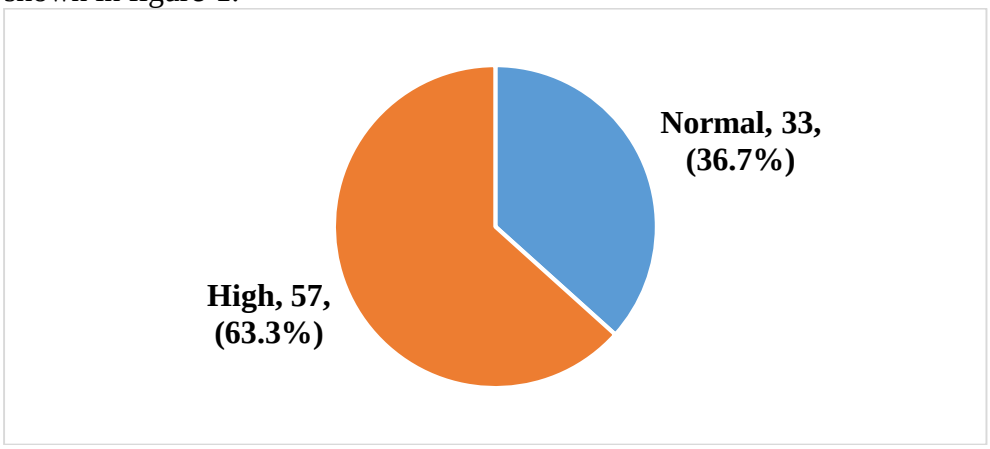

Figure 1. Prevalence of high mean platelets volume.

It is evident in Table 2 that around two thirds (64.9%) of patients with high MPV have high DAPSA score (severe disease) compared with 39.4% among patients with normal MPV (p = 0.015).

Table 2. Disease severity (assessed by DAPSA score) by MPV.

		Normal MPV	High MPV	
DAPSA	N	No. (%)	No. (%)	P
Low	15	10 (30.3)	5 (8.8)	
Moderate	25	10 (30.3)	15 (26.3)	
High	50	13 (39.4)	37 (64.9)	0.015
Total	90	33 (100.0)	57 (100.0)	

In addition, a positive significant correlation was detected between the MPV and the DAPSA score (rho = 0.441, p < 0.001), as presented in Figure 2.

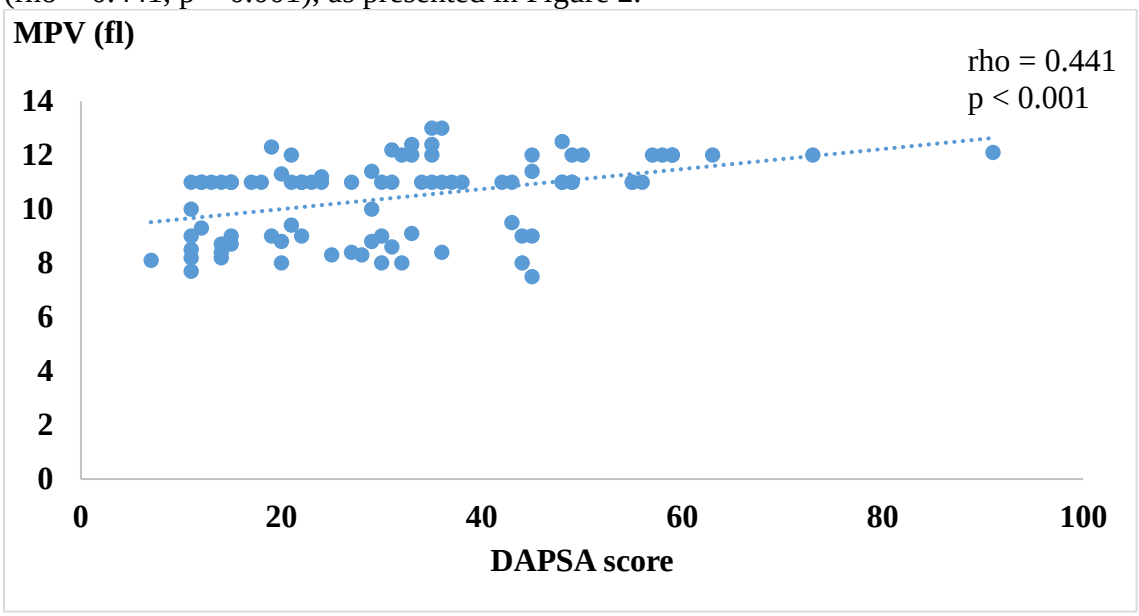

Figure 2. Correlation between MPV and DAPSA score.

It is evident in Table 3 that there was a positive significant ($p < 0.001$) correlation between the DAPSA score with MPV (rho = 0.441), ESR (rho = 0.406), and CRP (rho = 0.482). There was also a positive significant correlation between the MPV and ESR (rho = 0.339, p = 0.001).

Table 3. Correlations between DAPSA, MPV, ESR, and CRP.

		ESR	CRP
DAPSA	rho	0.406	0.482
	p	(< 0.001)	(< 0.001)
MPV	rho	0.339	0.196
	p	(0.001)	(0.064)
ESR	rho		0.221
	p		(0.037)

Table 4 shows that there was positive significant ($p < 0.001$) correlation between the DAPSA score with the following lipids; Cholesterol (rho = 0.359), TG (rho = 0.300), and LDL (rho = 0.281), and a negative significant ($p < 0.001$) correlation between the DAPSA score with HDL (rho = -.298). (Table 4).

Table 4. Correlation between DAPSA score and parameters of lipid profile.

		S. Cholesterol	TG	LDL	HDL
DAPSA	rho	0.359	0.300	0.281	-.298
	p	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)
S. Cholesterol	rho		0.514	0.541	0.030
	p		(< 0.001)	(<0.001)	(0.778)
TG	rho			0.430	0.075
	p			(< 0.001)	(0.485)
LDL	rho				-0.053
	p				(0.621)

DISCUSSION:

Psoriatic arthritis is a prolonged immune mediated inflammatory arthritis of the joints and entheses, especially those of the axial skeleton which is linked to an increased mortality from cardiovascular illnesses (14).MPV is cheap and affordable blood tests so it can be used as indicators of the disease activity in every day practice (15). MPV is involved in several systemic inflammatory disorders including ankylosing spondylitis (AS), systemic lupus erythematosus(SLE), rheumatoid arthritis(RA)and behcet but there are few details regarding its function and role in PsA which must be defined. According to the result of this study found that most of PsA cases 57 two thirds (64.9 %) had high MPV and 33 cases one third (36.7%) had normal MPV. This is consistent with studies performed by canpolat et al., 2010 (16), by Zhou et al., 2020 (17) .In contrast, another study done by Asahina et al., 2017 found that MPV value was negatively linked with arthritis, however the relationship between MPV value and inflammation was less obvious (18). According to the result of this study found that majority of high DAPSA score have

high MPV. There is a positive significant correlation between DAPSA score with MPV ($p < 0.001$), and low DAPSA score cases have normal MPV. This matched with another study done by Kılıç et al., 2017 (11). Traditional cardiovascular risk factors such as hypertension, diabetes, obesity, and hypercholesterolemia have been linked to those with higher MPV. Patients who have greater MPV and pre-existing coronary artery disease are more likely to suffer from myocardial infarction (MI), vascular mortality, and ischemic heart disease (19). This is in line with many other studies performed by Chu et al., 2010 (20) , and by Conic et al., 2020(12). On the other hand S He et al., 2019 showed that lower level of MPV significantly lower risks of CVD (21). According to the result of our study there is positive significant correlation between DAPSA score with ESR (rho =o.4o6), CRP (rho=0.482). This result in line with other two studies done by Duran , Pamuk , 2022 (22), and by Tam et al., 2008(23). However, another study by Pamuk et al., (2009) found that CRP not correlated with disease activity (24). This might be owing to a low or non-existent IL-6 marker, which is essential for acute-phase protein synthesis in hepatocytes (25). It has been found that there is statistically positive significant correlation between DAPSA score with parameters of lipid profile cholesterol, tri-glycerides, and low density lipo-proteins). This is consistent with two other studies done by Kibari et al., 2019(26), and by Bonek et al .,2022 (27). According to the result of this study there is low level HDL cholesterol this matched with another study done by Bonacina et al ., 2021(28). In this study 54.4% of psoriatic arthritis cases were overweight and14 cases were obese, this is in line with another study done by Coban et al., 2005 in which MPV was positively correlated with BMI in obese patients and elevated MPV may be an indicator of increased cardiovascular risk in obese persons(29).

The limitations of this study is that our sample size is relatively small, Pre -analytical technique can affect the result for example the technique of venepuncture and the degree of precision with which the sample tube is filled and gently mixed might induce platelet activation and the time interval of measurement, as well as the ideal storage temperature of the sample tube, to achieve the least amount of interference on the result. Most of patients was on treatment at time of participation which this may affect the result. In DAPSA score The patient's scoring for disease activity may influence the outcome, since the patient's tenderness score may be exaggerated. the key strength of this study is that the patients were on anti-platelet drugs were excluded and of all of PsA cases are not on lipid lowering agents like statins.

CONCLUSION:

MPV is a biomarker to assess disease activity in PsA. MPV was high and significantly correlate with DAPSA score. It has excellent sensitivity and specificity for determining disease activity in PsA. It's found that a significant higher prevalence of dyslipidaemias among PsA patients which also significantly correlates with DAPSA. High MPV and high lipid profile during active course of the disease need to be recognized and more potent management are required to reduce risks of complications.

CONFLICTS OF INTEREST:

The authors report no conflicts of interest.

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