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Short Report

Platelet Indexes and Disease Activity in Juvenile Idiopathic Arthritis.

Maria Mercedes Picarelli , Henrique Luiz Staub, Luiz Carlos Bodanese.

Affiliations:

- *Rheumatology Department – São Lucas Hospital - Pontifical Catholic University do Rio Grande do Sul. Porto Alegre - Rio Grande do Sul – Brazil.* ***Email:*** *maria.picarelli@pucrs.br*
- *Rheumatology Department – São Lucas Hospital - Pontifical Catholic University do Rio Grande do Sul.* ***Email:*** *henriquestaub@terra.com.br*
- *Cardiology Department - Hospital São Lucas - Pontifical University Católica do Rio Grande do Sul.Porto Alegre - Rio Grande do Sul – Brazil.* ***Email:*** *lcbodanese@pucrs.br*

Abstract

Objective: To test correlation between mean platelet volume (MPV), immature platelet fraction (IPF) with disease activity in a group of juvenile idiopathic arthritis (JIA) patients defined by JADAS 71. Determinate sensitivity, specificity, positive and negative predictive value.
Methods: A cross-sectional study included JIA patients with oligoarticular and polyarticular rheumatoid factor negative subtypes, with disease defined activity by JADAS 71. Other subtypes and patients with acute infection, neoplastic diseases, macrophage activation syndrome, other thrombocytopenias, other inflammatory diseases, and use of antiplatelet and anticoagulant medications were excluded. All blood parameters were processed in a SYSMEX XN 1000 haematology analyser.
Results: Twenty-five active and 21 inactive JIA disease patients were included. Oligoarticular subtype were 76%, 73,9% were female sex and 95,6% were caucasian. The median age was 10,30 [4,77 – 14] years and the median disease duration was 57 months [24 – 90,7]. The median JADAS 71 was 1,35 [0 – 10,25] with active disease above 1. There was no correlation between MPV and JADAS 71(rho = 0,204 e p = 0,185). There was no correlation between IPF and JADAS 71 (rho = 0,192 e p = 207). Sensitivity was 13% and specificity was 4,80%. Positive predictive value (PPV) was 75% and negative predictive value (PNV) was 50%. Sensitivity was 4,22%, and specificity was 0,0%, PPV was 36,8% and PNV was 100%.
Conclusions: MPV and IPF had no correlation with JADAS 71 in a group of JIA patients

Keywords : Juvenile idiopathic arthritis, mean platelet volume, immature platelet fraction, JADAS-71.

INTRODUCTION

Disease activity assessment is an essential issue in juvenile idiopathic arthritis (JIA) care. Newer serum markers are warranted, therefore. The ESR and the C-reactive protein (CRP) assay are knowingly nonspecific and have many interferers (1)

There has been robust evidence on the role of platelets in inflammation. Platelets display innate responses by expressing toll like receptors in their surface, and bridge innate and adaptative immunity by activating dendritic cells through the CD40-CD154 pathway (2,3). In inflammatory systemic diseases, IL-6 strongly stimulates thrombopoiesis (5,6,7). Of note, younger platelets have greater size and show higher metabolic activity as compared to mature cells (3,4).

Being so, platelet parameters may be clinically useful in systemic disorders. Mean platelet volume (MPV) is the measurement of platelet dimension during the morphologic phase (7). Immature platelet fraction (IPF) relies on the presence of RNA in the cytoplasm of young platelets (8,9). Both MPV and IPF appear to associate to high metabolic cell activity (10,13).

Studies exploring MPV in JIA patients are scanty and heterogenous. To our knowledge, there have been no studies of IPF in JIA patients. In this current survey of JIA, we aimed to correlate both MPV and IPF with disease activity as measured by the JADAS-71.

***Corresponding Author:** **Maria Mercedes Picarelli, MD,PhD.**, Rheumatology Department, Saint Lucas Hospital of Pontifical Catholic University of Rio Grande do Sul (PUCRS). Av. Ipiranga 6690, room 220. 90610-000, Porto Alegre-RS, Brazil, **Email:** maria.picarelli@pucrs.br.
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MATERIALS AND METHODS

Patients diagnosed with JIA (oligo or polyarticular, rheumatoid factor negative) according to the ILAR criteria (14) comprised our study population. A signed consent was obtained with the parents and patients. The study was approved by the local ethics committee. The JADAS-71 cut-off for active disease was considered as above 1 (15). Acute infection, neoplasms, other autoimmune disorders, and use of antiplatelet or anticoagulants constituted exclusion criteria. All blood samples were processed in a SYSMEX XN 1000 haematology analyser. For IPF, a specific platelet channel in Sysmex XN1000 plus the Fluorocell PLT® dye were used. All blood samples were processed in less of 120 minutes to avoid the effect of ethylenediaminetetraacetic acid in platelet size (11,12,16).

Continuous variables were presented by median and interquartile range. Categorical data were reported in absolute frequencies and percentages. Correlations of numerical variables were evaluated by Spearman coefficient. A receiver operating characteristic curve analysis (ROC) was produced to obtain the most precise level to identify patients with active disease. The level of significance defined was $p < 0,05$.

RESULTS AND DISCUSSION

Twenty-five active and 21 inactive JIA patients were included. Oligoarticular patients were 76%; 73.9% were female and 95.6% were Caucasian. Median age was 10.3 [4.7–14] years, and the median disease duration was 57 months [24–90.7]. The median JADAS-71 was 1.35 [0–10.2] for patients with active disease. Uveitis was present in 17.3% of patients, and antinuclear antibodies were detected in 56.5% of cases. Steroids were utilized by 17.4% of patients. Methotrexate was utilized in 26.1%, leflunomide in 32.6% and TNF blockers in 41.3% of patients. There were no significant differences in active and inactive patients regarding to sex, age, clinical subtype, and presence of uveitis ($p< 0.05$). Also, there were no significant differences in the ESR and levels of CRP in groups ($p<0.05$); the mean MPV was 9.6 fL in active patients and 9.4 fL in inactive patients, whereas the mean IPF was 2% for both groups ($p<0.05$).

There was no correlation of MPV with JADAS-71 (rho= 0.204; p=0.185), and of IPF with JADAS-71 (rho= 0.192; p=0.207). There was a good correlation of MPV with IPF (rho=0.866; p= 0.000). The ROC curve for MPV and JADAS-71 showed an under the curve area (UCA) of 0.412 (IC 95% 0.240–0.580), with an ideal cut-off of 8.15 fL for MPV. Sensitivity was 13% and specificity was 4.80%. Positive predictive value (PPV) was 75% and negative predictive value (NPV) was 50%. The ROC curve for IPF and JADAS-71 showed an UCA of 0.427 (IC 95% 0.258 –0.595) with an ideal cut-off of 0.35% for IPF. Sensitivity was 4.22%, and specificity was 0.0%; PPV was 36.8% and NPV was 100%.

Our study selected active JIA patients based on JADAS-71. The advent of the JADAS-71 ameliorated the assessment of disease activity, but novel markers might be assured. Most current markers do not reflect disease activity in all cases, especially in the set of treated patients without clinical evidence of disease activity in whom the possibility of reducing or withdraw treatment is considered.

In this context, platelet parameters might have a role as new inflammatory markers in autoimmune diseases such as JIA. This cross-sectional study had a clear definition of disease activity by using JADAS-71 in patients with oligo or polyarthritis, and negative for rheumatoid factor. Other characteristics were the long-lasting disease and long follow-up.

Clinical and laboratory variables, the latter including ESR and CRP, but also MPV and IPF, did not differ in active and inactive patients. Even though a good correlation of MPV with IPF was observed, none of them correlated significantly with the JADAS-71. The UCA in ROC curves disclosed a cut-off of 8.15 fL for MPV and of 0.35% for IP, data to be confirmed in further studies. Yet of importance, the PPV for the MPV and the NPV for the IPF were considerably high, but data on sensitivity and specificity were rather disappointing for both tests. Overall, our results do not support a correlation of MPV and IPF with the traditional JADAS-71 score.

Regarding MPV and JIA surveys, a retrospective study compared 64 active patients, 51 inactive patients and 64 healthy controls, being that elevated MPV was significantly seen in active patients as compared to the other two groups (17). In a cross-sectional study with 55 JIA patients, the MPV seemed to distinguish the systemic subtype from the oligoarticular an polyarticular patients (18). A case-control study accounted for no difference of MPV in JIA patients when compared to controls (19) As seen, data of MPV in JIA populations and scarce and divergent. Different study designs and JIA subtypes, unalike definitions of active disease and distinct assays might account for such heterogeneity.

Our study has limitations to be mentioned. The cross-sectional design, sample size and the absence of healthy controls might, in some way, restrict our conclusions. Novel studies may indeed clarify the role of platelet indexes in JIA and other autoimmune diseases.

Figure 1. MPV and JADAS ROC curve

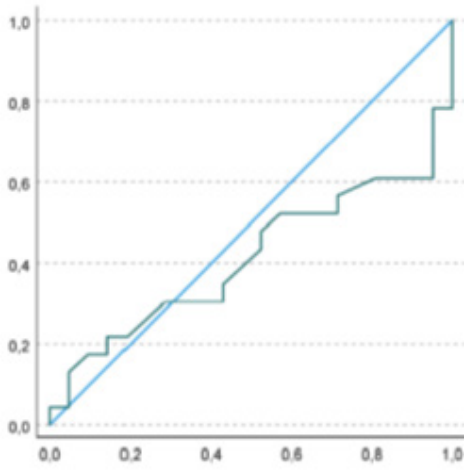
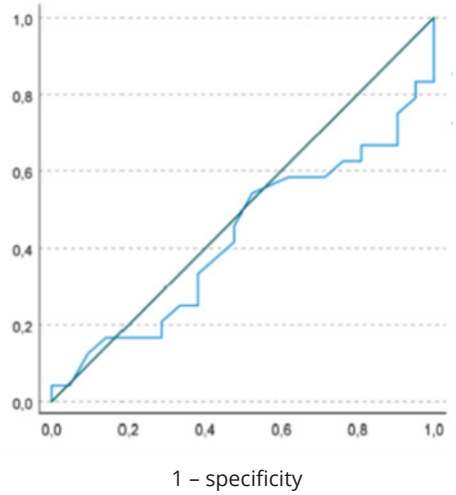


Figure 2. IPF and JADAS ROC curve.



CONCLUSION

In conclusion, our study (probably the first addressing the IPF in JIA) showed that MPV and IPF did not differ in active or inactive patients with JIA; moreover, none of the platelet indexes correlated with the JADAS-71. Considering the incongruent data, the study of platelet indexes in autoimmune disorders appears to be a field open to research.

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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REFERENCES

1. Haasnoot AJW, Van Tent-Hoeve M, Wulffraat NM, Schalij-Delfos NE, Los LI, Armbrust W, et al. Erythrocyte sedimentation rate as baseline predictor for the development of uveitis in children with juvenile idiopathic arthritis. Am J Ophthalmol.2015;159(2):372-377.e1.

2. Huang HS, Chang HH. Platelets in inflammation and immune modulations: Functions beyond hemostasis. Arch Immunol Ther Exp (Warsz). 2012;60(6):443–51.

3. Gremmel T, Frelinger AL, Michelson AD. Platelet physiology. Vol. 42, Seminars in Thrombosis and Hemostasis. Thieme Medical Publishers, Inc.; 2016. p. 191–204.

4. van der Meijden PEJ, Heemskerk JWM. Platelet biology and functions: new concepts and clinical perspectives. Vol. 16, Nature Reviews Cardiology. Nature Publishing Group; 2019. p. 166–79.

5. Gasparyan AY, Ayvazyan L, Mikhailidis DP, Kitas GD. Mean platelet volume: a link between thrombosis and inflammation? Curr Pharm Des. 2011;17(1):47–58.

6. Thon JN, Italiano JE. Does size matter in platelet production? Blood. 2012;120(8):1552–61.

7. Korniluk A, Koper-Lenkiewicz OM, Kamińska J, Kemona H, Dymicka-Piekarska V. Mean platelet volume (MPV): New perspectives for an old marker in the course and prognosis of inflammatory conditions. Mediators Inflamm. 2019;2019.

8. Buttarello M, Mezzapelle G, Freguglia F, Plebani M. Reticulated platelets and immature platelet fraction: Clinical applications and method limitations. Vol. 42, International Journal of Laboratory Hematology. Blackwell Publishing Ltd; 2020. p. 363–70.

9. Pluthero FG, Kahr WHA. The birth and death of platelets in health and disease. Physiology. 2018;33(3):225–34.

10. Holinstat M. Normal Platelet Function and. ACC Curr J Rev. 1999;1458(February):13–6.

11. Koupenova M, Clancy L, Corkrey HA, Freedman JE. Circulating platelets as mediators of immunity, inflammation, and thrombosis. Vol. 122, Circulation Research. Lippincott Williams and Wilkins; 2018. p. 337–51.

12. Iannacone M. Platelet-mediated modulation of adaptive immunity. Vol. 28, Seminars in Immunology. Academic Press; 2016. p. 555–60.

13. Bodrova V V., Shustova ON, Khaspekova SG, Mazurov A V. Platelet reticulated forms, size indexes and functional activity. Interactions in healthy volunteers. Platelets. 2022;33(3):398–403.

14. Ravelli A, Martini A. Juvenile idiopathic arthritis [Internet]. Vol. 369, www.thelancet.com. 2007.

15. Consolaro A, Ruperto N, Bazso A, Pistorio A, Magni-Manzoni S, Filocamo G, et al. Development and validation of a composite disease activity score for juvenile idiopathic arthritis. Arthritis Rheum [Internet].2009;61(5):658–66.

16. Buoro S, Seghezzi M, Manenti B, Pacioni A, Carobene A, Ceriotti F, et al. Biological variation of platelet parameters determined by the Sysmex XN hematology analyzer. Clinica Chimica Acta.2017;470:125–32.

17. Güneş A, Ece A, Şen V, Uluca Ü, Aktar F, Tan İ, et al. Correlation of mean platelet volume, neutrophil-to-lymphocyte ratio, and disease activity in children with juvenile ıdiopathic arthritis. Int J Clin Exp Med. 2015;8(7):11337–41.

18. Vakili M, Ziaee V, Moradinejad MH, Raeeskarami SR, Rahamooz T. Changes of Platelet Indices in Juvenile Idiopathic Arthritis in Acute Phase and After Two Months Treatment. 2016; 2016 May 11;26(3):e5006.

19. Sahin A, Bag O, Makay B, Ecevit CO. Role of Hematological Parameters in the Diagnosis of Juvenile Idiopathic Arthritis in Children with Arthritis. Andes Pediatrica. 2022;93(2):229–34.