Section: Pediatrics

Original Research Article

CLINICAL IMPORTANCE OF MEAN PLATELET VOLUME AND PLATELET COUNT IN NEPHROTIC SYNDROME

Komal Agarwal[1], Avinash K.[1], Arpita Gogoi[2], Sima Sonowal[3]

[1]Post Graduate Trainee, Department of Pediatrics, Assam Medical College, Dibrugarh, Assam, India
[2]Associate Professor, Department of Pediatrics, Assam Medical College, Dibrugarh, Assam, India
[3]Assistant Professor, Department of Pathology, Assam Medical College, Dibrugarh, Assam, India

Received : 31/03/2024
Received in revised form : 18/05/2024
Accepted : 01/06/2024

Keywords:
Nephrotic syndrome, Mean platelet volume, Platelet counts, Steroid sensitive Nephrotic syndrome.

Corresponding Author:
Dr. Komal Agarwal,
Email: akomalagarwal74@gmail.com

DOI: 10.47009/jamp.2024.6.3.120

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (3); 590-593

Abstract

Background: In recent years research has emphasized the importance of platelets in chronic diseases. Mean platelet count has been used as a marker in certain diseases. Nowadays, MPV is also used as a biomarker for some inflammatory and infectious diseases. The aim of the study is to determine the relationship between mean platelet volume and platelet count in the case of active nephrotic syndrome and during remission. **Materials and Methods:** The study was done among all cases of nephrotic syndrome aged 1-12 years attending the Department of Paediatrics, Assam Medical College and Hospital, Dibrugarh. The study was done for a period from October 2023 to April 2024. Based on the inclusion and the exclusion criteria the final sample size obtained was 50. Baseline data like the name, age, sex, anthropometry, and nephrotic syndrome type will be recorded. Laboratory parameters like Mean platelet volume, complete blood counts, Serum cholesterol, serum fasting triglycerides, Serum albumin, and urine routine were done. Data collected was entered in MS Excel and the statistical analysis was done in SPSS 23. P value <0.05 is considered as statistically significant. **Result:** The mean age of the study participants was 4.5±3.3 months in the study participants. Male preponderance (64%) was observed in our study. The mean platelet count was higher in the Active group compared to the Remission group and it was statistically significant. The mean platelet volume was significantly higher in the Remission group compared to the Active group. Thus, a negative correlation was observed between the MPV and platelet count (r=-.820) and it was statistically significant. **Conclusion:** Thus, our study concluded that the mean platelet count was inversely proportional to the mean platelet volume. Thus, MPV is a simple, cheap, and easy method to find out the disease progression and the steroid resistance.

INTRODUCTION

In primary hemostasis, platelet plays an important role by releasing growth factors and cytokines and is an important mediator in inflammation and immunomodulation.[1,2] In a healthy society there always exists an inverse relationship between the mean platelet volume and platelet count. Both quantitative and qualitative characteristics like platelet count, mean platelet volume, platelet activation, and increased surface expression of activation-dependent platelet markers have been used in markers predicting different inflammatory disorders including Nephrotic syndrome.

Nephrotic syndrome is defined by the presence of nephrotic range proteinuria (>40 mg/m2/hr; urine protein 3+ or 4+; urine protein/creatinine >2 mg/mg in first-morning urine sample), hypoalbuminemia (albumin <3.0 g/dL), and edema.[3]

Remission is defined as Urine protein nil or trace (Up/Uc <0.2 mg/mg) for three consecutive early morning specimens.[3]

Thromboembolic complications are quite common in Nephrotic syndrome. The increase and activation of platelet count are important in hypercoagulopathy.[4,5] Like platelet count in recent days, MPV is also used as a marker in some diseases. The size of the platelets can be assessed with the help of Mean Platelet volume(MPV). The rate of platelet production in patients who suffer from diseases related to bone marrow or platelet destruction can be determined with this index. Chronic kidney disease is indicated by low mean platelet volume and when it is

ISSN (O): 2687-5365; ISSN (P): 2753-6556

associated with increased platelet count, it will suggest inflammation or infection.[6,7]

The aim of the study is to determine the relationship between mean platelet volume and platelet count in the case of active nephrotic syndrome and during remission. Our primary objective is to study the correlation of mean platelet volume and platelet count with the activity of nephrotic syndrome.

MATERIALS AND METHODS

Place of Study: Department of Paediatrics, Assam Medical College & Hospital, Dibrugarh, Assam

Duration of Study: 7 months

Study Design: Prospective observational study

Study Population: All cases of nephrotic syndrome aged 1-12 years attending the Department of Paediatrics, Assam Medical College and Hospital, Dibrugarh fulfilling the inclusion and exclusion criteria admitted in the study period.

Sample Size: Based on the inclusion and exclusion criteria the sample will be recruited till the study period. The minimum sample size will be 50

Inclusion Criteria

- Children between 1 – 12 years with 1st episode or relapse of nephrotic syndrome
- Children between 1-12 years with nephrotic syndrome in remission

Exclusion Criteria

- Children age <1 year and >12 years
- Patients not given consent
- All sick and critically ill children
- Anemia < 8g/dl

Methods: A prospective observational study was commenced following the Institutional Ethical Committee's approval. Written informed consent was obtained from all the parents/guardians before starting the study. The proforma was filled by the parents or guardian.

Baseline data like the name, age, sex, anthropometry, and type of nephrotic syndrome were recorded. Laboratory parameters like the Mean platelet volume and complete blood counts were done with the 5 ml of venous blood drawn and collected in a 2ml EDTA vial. Serum fasting triglycerides, serum cholesterol, and serum albumin were sent for testing after collecting 3 ml of blood in a clot activator vial. For urine examination, a routine early morning mid-stream sample was collected for three days to define relapse and remission.

Statistical analysis: Statistical analysis was entered in MS Excel Windows 10. Statistical analysis was done with the help of SPSS 23. Continuous data was expressed in terms of mean and standard deviation. Categorical data was expressed in terms of Numbers and Percentages. The test of association for Categorical data was the chi-square test and for continuous data was the t-test and ANOVA test. P value <0.05 is considered as statistically significant.

RESULTS

The mean age of the study participants was 4.5±3.3 months in the study participants. Male preponderance (64%) was observed in the groups. The systolic blood pressure of the study participants was found to be 106.4±14.44 and the diastolic blood pressure was found to be 64.42±8.77. [Table 1]

Mean serum cholesterol was found to be 430±158; mean serum fasting triglycerides was 348 ±168 and mean serum albumin was 2.1± 0.4. [Table 2]

The mean platelet count was higher in the Active group compared to the Remission group and it was statistically significant. The mean platelet volume was significantly higher in the Remission group compared to the Active phase group. [Table 3]

A strong negative correlation is observed between the mean platelet count and mean Mean Platelet Volume (r=-.820, p=<0.001*). [Table 4]

Table 1: Baseline characteristics of the study participants.

Baseline variables	Study participants N(50)
Mean Age(years)	4.5±3.3
Sex (Male/ Female)	32(64%) 18(36%)
Systolic blood pressure (mmHg)	106.4±14.44
Diastolic blood pressure (mmHg)	64.42±8.77

Table 2: Laboratory parameters of the study participants

Variables	Laboratory parameters	
	Mean	Standard deviation
Serum fasting triglycerides (mg/dl)	348	168
Serum Cholesterol (mg/dl)	430	158
Serum Albumin (g/dl)	2.1	0.4

Table 3: Platelet parameters during active and remission phases of Nephrotic syndrome

Platelet parameter	Active phase N(50)	Remission N(50)	p-value
Mean platelet count(/cumm) Active phase	352.4±127.5	304.47±112.03	0.004*
Mean Platelet volume (MPV) (fL) Active phase	7.78 ±1.03	8.4±1.03	0.003*

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 4: Correlation between the MPV and platelet count

Pearsons correlation		Mean platelet count	Mean platelet volume
Mean platelet count	Correlation coefficient Sig (2 tailed) N	 1.000 50	-.820 .0001 50
Mean Platelet volume (MPV)	Correlation coefficient Sig (2 tailed) N	-.820 .000 50	 .0001 50

DISCUSSION

In healthy individuals, an inverse correlation exists between the platelet count and MPV. Lower MPV and higher platelet count were seen in the active phase of inflammatory disorders in recent studies.[8] In nephrotic syndrome, thromboembolic events are more common. The thrombosis risk increases due to inactivity, hypovolemia, hypercoagulability, and infections. Thrombocytosis, decreased coagulation inhibitors and increased procoagulants also increase the risk of thrombosis.

Walter et al in 1981 stated in their study that increased platelet count and spontaneous aggregation were noted in nephrotic syndrome. This count normalized after the long-term remission. Still, the exact mechanism for this increase in platelet count is not understood completely. A correlation was observed in a study between hypercholesterolemia and hypoalbuminemia with increased platelet counts and platelet hyperaggregation.[9,10]

The mean age of the study participants was 4.5±3.3 months in the study participants. Male preponderance was observed in the study (82%).

The mean platelet count was higher in the active phase compared to the Remission group and it was Statistically significant. The mean MPV was significantly higher in the Remission phase compared to the active phase. A negative relation was seen in our study between the mean MPV and mean platelet count(r=-0.820). Similar results were also seen in Gamal B et al,[11] study. Kaan Gulleroglu et al,[12] and Ismail et al,[13] also showed results in agreement with us. A study done by Wasilewska AM et al,[14] showed a negative correlation between the mean platelet count and mean platelet volume in nephrotic syndrome patients. This may be due to the growth factors and cytokine effect related to the unhindered proteinuria due to the lack of suppression of platelet hyperactivity. This is important in the renal failure pathogenesis of patients who have for longer periods. Mean platelet volume is a reflection of platelet size and thus it correlates with the platelet activation and function. Mean platelet volume is found to be associated with increased platelet activity. Dense granules which are metabolically and enzymatically more active are present in large quantities in large platelets compared to smaller platelets. Thus, MPV is a determinant of the activated platelets and is considered a risk factor for thromboembolism. So, it is relatively reliable as a marker for platelet function and thrombosis. In our study, a negative correlation is observed between the MPV and mean platelet count. Similar results were also seen in Goida et al study.[15]

Limitation: The sample size was small. The study has to be done in a larger sample and in a multicenter to generalize the results.

CONCLUSION

Thus, our study concluded that the mean platelet count was inversely proportional to the mean platelet volume. Thus, MPV is a simple, cheap, and easy method to find out the disease progression and the steroid resistance. Follow-up has to be done carefully for patients with low MPV as it is accompanied by thrombocytosis and will develop FSGS.

Ethical Approval: This study was approved by Institutional ethical committee(H) ,Assam medical College. No 2023/AMC/EC/10808

REFERENCES

1. Eneman B, Lavtchenko E,Van den Heuvel B,Van Geet C,Freson K.Platelet abnormalities in nephrotic syndrome.Pediatr Nephrol.2016.31:1267-79
2. Zdrojewski Z,Raszeja-Specht A,Kutosz J,Skibowska A,Rutkowski B.Evaluation of factors influencing platelet aggregation in patients with chronic glomerulonephritis.Przegel Lek.1996;53:434-8
3. Sinha, Aditi, et al. 'Steroid Sensitive Nephrotic Syndrome: Revised Guidelines'. Indian Pediatrics, vol. 58, no. 5, May 2021, pp. 461–81. DOI.org (Crossref), https://doi.org/10.1007/s13312-021-2217-3.
4. Bauvois B,Mothu N,Nguyen J,Nguyen-Khoa T,Noel LH,Jungers P.Specific changes in plasma concentration of matrix metalloproteinase -2 and -9,TIMP-1 and TGF-beta 1 in patients with distinct types of primary glomerulonephritis.Nephrol Dial Transplant.2007;22(4):1115-1122
5. Jackson SR,Carter JM.Platelet volume:laboratory measurement and clinical application.Blood Rev.1993;7:104-113
6. Neunert C,Lim W,Crowther M.American Society of Haematology the American Society of Hematology evidence-based practice guideline for immune thrombocytopenia,Blood.2011:117(16):4190-4207
7. Kleigman RM,Stanton BF,St .Geme JW.Nelson Textbook of Pediatrics.Ed 19,Philadelphia.2011:Saunders,2011,1648-1722.
8. Gulleroglu K,Yazar B,Sakalli H,Ozdemir H,Baskin E.Clinical importance of mean platelet volume in children with nephrotic syndrome.Ren Fail.2014;36:663-5
9. Wasilerska AM,Zoch-Zwierz WM,Tomaszewska B,Biernacka A.Platelet derived growth factor and platelet profiles in childhood nephrotic syndrome.Pediatr Nephrol.2005;20:36-41
10. Eneman B,Levtchenko E,Van den Heuvel B,Van Geet C,Freson K.Platelet abnormalities in nephrotic syndrome.Pediatr Nephrol.2016;31:1267-79
11. Gamal B Mohamed,Asmaa N Moustafa,hanan M Kamel ,Mohammed G Hassan.Prognostic validity of mean platelet volume in children with nephrotic syndrome.International Journal of Medical and Health Research.2018.4(7):86-90

ISSN (O): 2687-5365; ISSN (P): 2753-6556

12. Kaan Gullerogu,Baris Yazar,Hale Sakalli,Handan Ozdemir,Esra Baskin.Clinical importance of mean platelet volume in children with nephrotic syndrome.Ren Fail.2014:36(5):663-665
13. Ismail Kocyigit,Mahmut Ilker Yilmaz,Yasin S,ims,ek.The role of platelet activation in determining response in patients with primary nephrotic syndrome.Platelets ,2013:24(6):474-479
14. Wasilewska AM,Zoch Zwierz WM,Tomaszewska B,Biernacka A.Platelet derived growth factor and platelet profiles in children nephrotic syndrome.Pediatr Nephrol.2005:20:36-41
15. Guida J,Kunig A,Leef K,Mckenzie S,Paul D.Platelet count and sepsis in very low birth weight neonates.Pediatrics.2003:111:1411-1415

ISSN (O): 2687-5365; ISSN (P): 2753-6556