

Original Article

CORRELATION BETWEEN MEAN PLATELET VOLUME AND SEVERITY OF ACUTE DIARRHEA IN CHILDREN

Muhammad Faheem Afzal, Sara Khalid, Khawaja Amjad Hassan and Asif Hanif

Objective: To determine the correlation between mean platelet volume and severity of acute diarrhea in children.

Methods: This cross-sectional study was conducted in Department of Pediatrics, King Edward Medical University/ Mayo hospital Lahore in six months (January to June 2018). Total 100 patients aged between 2-60 months were enrolled. After obtaining demographic and clinical data, severity of acute diarrhea was assessed by Modified Vesikari scoring system. Samples of complete blood count were taken to calculate mean platelet volume. Data was analyzed using SPSS 22. Pearson's correlation analysis was performed to estimate coefficient of correlation between mean platelet volume and severity of diarrhea.

Results: A total of 100 patients of acute diarrhea were enrolled. The mean age of the patients was 16 ± 15 months. Out of 100, 57% were male and 73% patients were of age 2-24 months. The mean MPV and severity score was 8.5 ± 2.5 fL and 11.4 ± 2.5 respectively. There was a negative correlation between MPV and severity score with a Pearson correlation coefficient of -0.097 with p-value 0.337. The correlation coefficient between MPV and severity score was -0.080 ($p=0.553$) in males and -0.090 ($p=0.566$) in females. The correlation coefficient between MPV and severity score was -0.152 ($p=0.201$) and 0.065 ($p=0.747$) in patients aged 2-24, and 24-60 month.

Conclusions: There is negative correlation between mean platelet volume and severity of acute diarrhea. MPV may not be the determinant of severity of acute diarrhea.

Keywords: acute diarrhea, mean platelet volume, children, severity .

Introduction

Acute diarrhea is defined as passage of ≥ 3 loose stools. This may or may not be associated with vomiting, fever, or abdominal pain, lasting for less than 14 days. In low-income countries, children < 3 years old experience on average three episodes of diarrhea every year.^{1,2} Total leukocyte count, erythrocyte sedimentation rate (ESR), and C-reactive protein are good predictors of acute inflammation and severity of disease. Although, role of ESR is well established as inflammatory markers, it is influenced by several factors such as age, sex and anemia.^{3,4,5} Platelets have a role in homeostasis, inflammation, immunity, and tissue regeneration.^{6,7,8} Disease-specific complications may be triggered from thrombotic and inflammatory agents, released from platelets.^{9,10,11} Therefore, mean platelet volume (MPV), a marker of platelet function and activation, may serve as inflammatory marker. MPV is studied in diarrhea and other systemic diseases.^{12,13} Küçük et al³ reported MPV as positive predictor of severity in diarrhea, whereas Çelik et al^{14,15} have found MPV as negative predictor of severity of acute rotavirus diarrhea and positive in bacterial and amebic diarrhea. The

correlation between MPV and severity of diarrhea has also not been studied in our population. Therefore, this study was designed to determine the correlation of mean platelet volume and severity of acute diarrhea in children.

Methods

This cross-sectional study was conducted in the Department of Pediatrics, King Edward Medical University/ Mayo hospital Lahore from January to June 2018. This study was approved by Institutional Review Board. Informed consent was taken from parents or care giver. Total 100 patients (estimated using prevalence of 5.5% diarrhea¹⁶ in children at 4.5% margin of error and 95% confidence level) of aged between 2-60 months of both genders fulfilling the case definition of acute diarrhea (passage of ≥ 3 loose stools per day or more frequent for the individual, with or without associated vomiting or fever lasting for less than 14 days) were enrolled by non-probability convenient sampling. Children with bloody diarrhea, or persistent diarrhea (lasting for more than 14 days) were excluded. Demographic data was recorded. The severity of diarrhea in patients was evaluated according to the assessment of hydration

protocol of integrated management of childhood and neonatal illness (IMNCI). A 1cc heparinized blood sample for complete blood count (CBC) was obtained adopting aseptic measures and was sent to Paediatric Haematology laboratory of Mayo Hospital, Lahore. Mean platelet volume (MPV) was generated by CBC analyzer (Normal value of MPV 7.5-11.5fL). Data on all the cases were subjected to statistical analysis through SPSS version 22 computer software. Pearson's correlation analysis was performed to estimate coefficient of correlation between mean platelet volume and severity of diarrhea.

Results

A total of 100 patients of acute diarrhea fulfilling the inclusion/exclusion criteria were enrolled in the study to calculate the correlation between severity score of diarrhea and MPV in patients with watery diarrhea. The mean age of the patients was 16 ± 15 months. Out of 100, 57% were male and 73% patients were of age 2-24 months (**Table 1**). The mean MPV and severity score was 8.5 ± 2.5 fL and 11.4 ± 2.5 respectively. There was a negative correlation between MPV and severity score with a Pearson correlation coefficient of -0.097 with p-value 0.337. After stratifying the data for gender the

Table-1: Distribution of cases by age and gender (n=100).

Variables	n (Percentage)	
Age groups (years)	2-24 Months	73 (73%)
	25-60 Months	27 (27%)
Gender	Male	57 (57%)
	Female	43 (43%)

Table-2: Correlation between severity score and MPV (n=100).

Correlation between severity score and MPV	n	100
	r	-0.097
	p-value	0.337
Correlation between severity score and MPV in male	n	57
	r	-0.080
	p-value	0.533
Correlation between severity score and MPV in Female	n	43
	r	-0.090
	p-value	0.566
Correlation between severity score and MPV in 2-24 months	n	73
	r	-0.152
	p-value	0.201
Correlation between severity score and MPV in 25-60 months	n	27
	r	0.065
	p-value	0.747

correlation coefficient between MPV and severity score was -0.080 (p=0.553) in males and -0.090 (p=0.566) in females. When stratified for age, the correlation coefficient between MPV and severity score was -0.152 (p=0.201) and 0.065 (p=0.747) in patients aged 2-24, and 24-60 month. Although it is reverse correlation for older age group, but is statistically not significant. (**Table 2**)

Discussion

Although MPV levels are accepted as acute phase reactants, this inverse relationship is frequently described in some pathological conditions.¹³ However, role of MPV in acute diarrhea has not been fully established. Present study demonstrated negative correlation of MPV levels of children with severity of acute diarrhea. Various studies have enumerated the correlation of MPV in microbiologically proved acute diarrhea. Mete et al¹⁷ found positive correlation between severity score and MPV levels in rotavirus diarrhea. Küçük³ reported positive correlation whereas Çelik^{14,15} reported MPV as negative correlation of severity of acute rotavirus diarrhea. Öztürk et al¹⁸ reported negative correlation of MPV in the adenovirus gastroenteritis. The difference in the results may be due to difference in sample size and availability of bacteriological or virological diagnosis.

In this study MPV levels were negatively correlated with severity score. We found positive correlation between MPV and severity score in patients aged 24-60 month but despite of this reverse correlation for older age group, it was statistically not significant. This highlights the importance of further studies with larger sample size and wider age groups.

The major limitation of present study is the cross sectional study. A prospective study which analyzes the alterations of MPV before and after rehydration therapy is needed. Another limitation is the lack of microbial diagnosis.

Conclusion

There is negative correlation between mean platelet volume and severity of acute diarrhea. However, this correlation is not statistical significant. Therefore, MPV may not be the determinant of severity of acute diarrhea.

*Department of Pediatric Medicine
KEMU/Mayo Hospital, Lahore.
www.esculapio.pk*

References

1. World Health Organization. Diarrhea. [Online] 2017 [cited 2018 Oct 27]. Available from: <http://www.who.int/topics/diarrhoea/en/>
2. Navaneethan U, Giannella RA. Mechanisms of infectious diarrhea. *Nat Clin Pract Gastroenterol Hepatol* 2008;5(11):637-47.
3. Küçük Ö, Uğraş M, Biçer S, Giray T, Çöl D, Yalvaç Z et al. Mean platelet volume value changes in acute noninfectious and infectious diarrhea. *Yeditepe Med J* 2015;9(33):875-83.
4. Ozyurt S. Prognostic value of hematological parameters. *J Clin Anal Med* 2018;9:10.
5. Gasparyan AY, Ayvazyan L, Mikhailidis DP, Kitas GD. Mean platelet volume: A link between thrombosis and inflammation? *Curr Pharm Des* 2011;17: 47-58.
6. Beyan C, Kaptan K, Ifran A. Platelet count, mean platelet volume, platelet distribution width, and plateletcrit do not correlate with optical platelet aggregation responses in healthy volunteers. *J Thromb Thrombolysis* 2006;22(3):161-4.
7. Ware J, Corken A, Khetpal R. Platelet function beyond hemostasis and thrombosis. *Curr Opin Hematol* 2013;20(5):451-6.
8. Catal F, Baybek N, Bayrak O, Uz E, Isik B, Karabel M, et al. Platelet parameters in children with upper urinary tract infection: Is there a specific response? *Ren Fail* 2008; 30: 377-81.
9. Rondina MT, Weyrich AS, Zimmerman GA. Platelets as cellular effectors of inflammation in vascular diseases. *Circ Res* 2013;112(11):1506-19.
10. Jenne CN, Urrutia R, Kubes P. Platelets: bridging hemostasis, inflammation, and immunity. *Int J Lab Hematol* 2013;35(3):254-61.
11. Aydemir H, Piskin N, Akduman D, Kokturk F, Aktas E. Platelet and mean platelet volume kinetics in adult patients with sepsis. *Platelets* 2015;26(4):331-5.
12. Gasparyan AY, Ayvazyan L, Pretorius E, Kitas GD. Platelets in rheumatic diseases: friend or foe? *Curr Pharm Des* 2014;20(4):552-66.
13. Chesnutt JK, Han HC. Platelet size and density affect shear-induced thrombus formation in tortuous arterioles. *Phys Biol* 2013; 10(5):056003.
14. Öztürk ZA, Dag MS, Kuyumcu ME. Could platelet indices be new biomarkers for inflammatory bowel diseases. *Eur Rev Med Pharmacol Sci* 2013;17(3):334-41.
15. Çelik T, Güler E, Berksoy EA, Arslan N. Mean platelet volume as a negative marker of inflammation in children with rotavirus gastroenteritis; *Iran J Pediatr* 2014;24(5): 617-22.
16. Çelik T, Güler E, Berksoy EA, Sorguç Y, Arslan N. Mean platelet volume in children with acute gastroenteritis caused by *Entamoeba histolytica*; *Türkiye Parazitol Derg* 2015;39(3):205-8.
17. Gupta A. Study of prevalence in diarrhea in children under the age of five years: its association with wasting. *Indian J Sci Res* 2014;7(1):1315-8.
18. Mete E, Akelma AZ, Cizmeci MN. Decreased mean platelet volume in children with acute rotavirus gastroenteritis. *Platelets* 2013;25(1):51-4.
19. Öztürk AB. Changes in MPV, PCT and other laboratory parameters in children with adenovirus gastroenteritis. *J Clin Anal Med* 2017;8(suppl 2): 164-7.