



“EVALUATION OF MEAN PLATELET VOLUME(MPV) AS PROGNOSTIC CRITERIA IN CRITICALLY ILL SEPTIC PATIENTS.”

General Medicine

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ABSTRACT

Assessment of Mean Platelet Volume(MPV) as a predictor of Mortality in patients with Severe Sepsis or Septic Shock. **Aim And Objective-** To evaluate the correlation which exists between the change in Mean Platelet Volume of patients of Severe Sepsis and their mortality in 28 days during their 72 hours of admission. **Materials and Methods:** We prospectively enrolled 50 patients admitted to ICU of Rama Medical College through Emergency department received standardized resuscitation for severe sepsis and/or septic shock between December 2022 and May 2023. The Changes in platelet indices, including $\Delta MPV_{72h-adm}$, were compared between survivors and non-survivors by linear mixed model analysis. The prognostic value of $\Delta MPV_{72h-adm}$ for 28-day mortality was ascertained by Cox proportional hazards model analysis. **Conclusion:** An increase in MPV during the first 72 hours of hospitalization is an independent risk factor for adverse clinical outcomes. Therefore, continuous monitoring of MPV may be useful to stratify mortality risk in patients with severe sepsis or septic shock.

KEYWORDS

Mean Platelet Volume(MPV), Sepsis

INTRODUCTION

- The Mean platelet volume (MPV) describes the average size of platelets in a blood sample and is routinely measured by Automated hematology analyzers using optical fluorescence method.
- Increased platelet volume and size reflects the existence of a thrombotic and inflammatory changes; thus, MPV is suggested as a possible marker of platelet function and activation.
- Several studies have shown that increased MPV is an independent risk factor for cardio- and cerebrovascular diseases and is associated with poor clinical outcomes of these diseases. Additionally, MPV has been considered as an index for inflammation, disease activity, and efficacy of anti-inflammatory treatment in several chronic inflammatory disorders like IBD, RA and AS.
- The time course of platelet counts and its function in critically ill patients, especially in patients with sepsis, have been elucidated by several previous studies.
- Only a few studies have revealed the relationship between MPV and prognosis in infectious diseases, including sepsis. Moreover, little is known about the potential influence of MPV and its change on mortality in a homogenous group of patients with sepsis.
- We investigated whether the change in MPV between baseline and 72 hours after hospital admission has prognostic value for clinical outcomes in severe sepsis and/or septic shock.

AIMS AND OBJECTIVES

AIM: This study aims to evaluate Mean Platelet Volume as prognostic criteria in critically ill sepsis patients.

OBJECTIVES:

- This study evaluates the Change in Mean Platelet Volume from the time of Admission to 72 hours after admission.
- This also correlates the changes in Mean Platelet volume with the mortality of patients in 28 days since admission.

MATERIALS AND METHODS

Patients

We prospectively enrolled 50 Eligible adult patients admitted to the emergency department (ED) of NC Medical College with the clinical features of severe sepsis and/or septic shock between Dec 2022 to May 2023. The MPV at the time of admission and After 72 hours were assessed.

Data Collection

Baseline characteristics, including demographic information and comorbidities, were collected. For disease severity assessment, APACHE II score and SOFA score were determined according to the worst values within the initial 24 hours of ED admission. The SOFA

score was calculated from the following parameters: arterial partial pressure of oxygen/fraction of inspired oxygen, platelet count, bilirubin, blood pressure and use of an inotropic agent, Glasgow Coma Scale score, and creatinine level or urine output. MPV, platelet count, White blood cell (WBC) count, and hemoglobin (Hb) level were measured at initial presentation and at 36 and 72 hours after ED admission. The normal reference range for MPV in our hospital laboratory is 7.4 to 10.4 fl.

Definitions

Sepsis is defined as a life threatening organ dysfunction caused by a dysregulated host response to infection

Clinical criteria for Sepsis include:

- Suspected Infection
- Acute organ Dysfunction defined as an increase by 2 or more points from baseline on the SOFA Score. (SOFA Score is a 24 points measure of Organ dysfunction that uses 6 organ systems i.e. Renal, Hepatic, Cardiovascular, Pulmonary, Neurologic and Hematology where 0-4 points assigned per organ system.)

Septic Shock is subset of Sepsis in which underlying circulatory and cellular/metabolic abnormalities lead to substantially increases mortality risk.

Criteria for Septic Shock include Sepsis plus the need for vasopressor therapy to elevate MAP to >65 mmhg with a Serum Lactate concentration >2.0 mmol/L despite adequate Fluid resuscitation.

Statistical Analysis

The Changes in platelet indices, including $\Delta MPV_{72h-adm}$, were compared between survivors and non-survivors by linear mixed model analysis. The prognostic value of $\Delta MPV_{72h-adm}$ for 28-day mortality was ascertained by Cox proportional hazards model analysis.

RESULTS

Total 11(21.1%) patients died within 28 days after ED admission. The MPV of survivors at admission is 8.34 ± 1.16 and after 72 hours is 8.70 ± 1.10 and the MPV of non survivors at admission is 9.34 ± 1.66 and after 72 hours is 10.25 ± 1.68 . MPV levels increased significantly during the first 72 hours in both non-survivors ($P = 0.001$) and survivors ($P < 0.001$). However, the linear mixed model revealed a significantly increased rate of MPV over the first 72 hours in non-survivors than in survivors ($P = 0.003$).

In addition, $\Delta MPV_{72h-adm}$ defined as MPV at 72 hours—MPV at baseline, was significantly greater in non-survivors than in survivors. In this analysis, $\Delta MPV_{72h-adm}$ was an independent predictor of 28-day mortality, after adjusting for plausible confounders.

Variables	Baselines	At 36 Hours	At 72 Hours
MPV(fl)			
Survivors	8.34±1.16	8.56±1.10	8.70±1.10
Non Survivors	9.34±1.66	9.86±1.56	10.25±1.68
Platelet Counts($\times 10^3/\text{mm}^3$)			
Survivors	208.6±97.6	186.6±106.2	164.8±96.2
Non Survivors	150.8±86.4	130.2±98.2	96.4±76.2
Data are Mean $\pm$ SD			



Comparison of trends in the platelet indices between survivors and non-survivors during the first 72 hours after emergency department admission.

- (A) The rate of mean platelet volume increase over the first 72 hours in non-survivors was significantly different from that observed in survivors ($P=0.003$).
- (B) The rate of platelet count decline over the first 72 hours was comparable between the 2 groups ($P=0.360$).

DISCUSSION

Severe sepsis and/or septic shock are major healthcare problems affecting millions of people worldwide each year.

- The mortality rates of these conditions are 25% to 80%, depending on illness severity, and the number of occurrences and the severity of organ failure.
- In this study we verified the increase in MPV during the first 72 hours after hospital admission and found a steeper MPV increase in non-survivors than in survivors.
- During the clinical course of sepsis, platelets exhibit diverse characteristics on a wide continuum from hyperactivation to exhaustion, and thrombocytopenia occurs frequently, implying that platelets are involved in pathophysiology beyond hemostatic function.
- Generally, platelet counts in patients with sepsis markedly decrease during the first 4 days of hospital admission, and the inverse relationship between platelet count and MPV has been described frequently in physiologic and some pathologic conditions. We also observed this inverse relationship in the present study.
- Other studies results are also consistent with the present study findings, and together, these data suggest that continuous monitoring of changes in MPV may play a role in risk stratification of patients with Severe Sepsis and/or septic shock.

CONCLUSIONS

We revealed a greater increase of MPV in non-survivors of severe sepsis and/or septic shock compared with survivors during the first 72 hours after hospitalization and found that an increase in MPV from baseline is an independent risk factor for 28-day all-cause mortality. MPV can be used as an additional and complementary maker with several established measures of illness severity such as SOFA score, APACHE II score, CRP, albumin, and lactate. Moreover, repeating measurement of MPV may be helpful to predict the prognosis of patients with severe sepsis and/or septic shock. We suggest that Physicians should be more attentive to septic patients with higher baseline MPV and tendency of increase in MPV.

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