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Mean Platelet Volume and its outcome in severe sepsis- A hospital based study

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Abstract

Background: *Sepsis is defined as the presence (probable or documented) of infection together with systemic manifestations of infection. Severe sepsis is defined as sepsis plus sepsis-induced organ dysfunction or tissue hypo-perfusion. Mean platelet volume (MPV) is a machine-calculated measurement of the average size of platelets found in blood and is typically included in blood tests as part of the CBC. It is considered as an indirect marker for acute thrombocytopenia. This study aims to look at the response of Mean Platelet Volume in severe sepsis and its capability in prognostication with an initial value.*

Objective: *To assess the association between Mean Platelet Volume (MPV) on Day 1 of ICU admission and the outcome in patients with Severe Sepsis admitted in Medical ICU of Govt. T D Medical College, Alappuzha*

Materials and Methods: *It is a prospective observational study of 1 year duration. All patients with severe sepsis admitted in Medical ICU of Govt. T D Medical College, Alappuzha during the study period, who met the inclusion and exclusion criteria were taken as study subjects. Patients were divided according to their outcome into Expired and Shift out category of equal numbers. The total sample size of the study is 300. Data obtained were analyzed using SPSS 20.*

Results: *Out of 300 patients who were selected after passing through the inclusion and exclusion criteria, 195 were male and 105 female patients. The most common reason for admission was Pneumonia (110 patients) followed by Leptospirosis (70 patients). There was no significant difference in the gender and mean age between Expired and Shift out category. There was a significant difference in MPV Day 1 between Expired and Shift out groups with a t value of 3.92 and a $p<0.01$. Also there was a significant difference in Highest MPV between Expired and Shift out groups with a t value of 4.37 and a $p<0.01$. The MPV day 1 and Highest MPV were significantly higher in Expired group compared to Shift out group.*

Conclusion: *Mean Platelet Volume, which is a part and parcel of a Complete Blood Count, is a hidden gem in our diagnostic panel which can help us to identify a patient with a possibly poor outcome on admission. A*

high MPV on admission to the ICU with severe Sepsis, suggests a higher chance of mortality during ICU stay.

Key words: *Severe sepsis; Mean Platelet Volume (MPV); Platelets; Thrombocytopenia; Expired, Shift out.*

Introduction

Humans mount both local and systemic responses to microbes that traverse their epithelial barriers and enter underlying tissues. Fever or hypothermia, leukocytosis or leukopenia, tachypnea, and tachycardia are cardinal signs of the systemic response.

Sepsis is defined as the presence (probable or documented) of infection together with systemic manifestations of infection. Severe sepsis is defined as sepsis plus sepsis-induced organ dysfunction or tissue hypo-perfusion.

The incidence of severe sepsis and septic shock has increased over the past 30 years. Approximately two-thirds of the cases occur in patients with significant underlying illness. Sepsis-related incidence and mortality rates increase with age and pre-existing comorbidity.

Mean platelet volume (MPV) is a machine-calculated measurement of the average size of platelets found in blood and is typically included in blood tests as part of the CBC.

It is considered as an indirect marker for acute thrombocytopenia. Acute thrombocytopenia (whatever the cause), in the setting of an intact marrow function, results in increased thrombopoeisis and large platelets.

Normal range of MPV is 7.5-11.5 fL.

Recent studies have brought to light the response of various Blood Indices in Severe Sepsis. Research has been done into the response of Red Blood Cells and Platelets to an episode of severe sepsis. While multiple studies have looked at the efficacy of Red Cell Distribution Width (RDW) in severe sepsis, it has not been found to accurately predict the outcome in these patients. Conflicting reports have surfaced regarding the usefulness of Mean Platelet Volume (MPV) as a prognostic marker in severe sepsis.

This study aims to look at the response of Mean Platelet Volume in severe sepsis and its capability in prognostication with an initial value.

This study will help us to determine whether an initial value of MPV will tell us the likely outcome of a patient in severe sepsis?

MPV was chosen as no extra cost is required in testing for this entity. It is routinely done as a part of the Complete Blood Count panel which is regularly sent for patients with severe sepsis. This, therefore, is an added bonus since affordability would not limit this study.

Objectives

The primary objective was to assess the association between Mean Platelet Volume (MPV) on Day 1 of ICU admission and the outcome in patients with Severe Sepsis admitted in Medical ICU of Govt. T D Medical College, Alappuzha.

The secondary objective was to assess the association between Highest MPV during ICU stay and the outcome.

Materials And Methods

This was a Prospective observational study of one year duration conducted in the Medical ICU of Govt. T D Medical College, Alappuzha.The sample size of this study was 300.

The inclusion criteria were patients identified as cases of Severe Sepsis as per the guidelines provided by the Society of Critical Care Medicine‘s latest recommendations, patients above the age of 18 years and patients (or relatives if the patient is not in a condition to give consent) consenting to take part in study.

The exclusion criteria were known or suspected cases of hematological malignancies or other primary marrow disorders, immune thrombocytopenic purpura (ITP), platelet structural and functional disorders and those on chemotherapy. The study variables included age, sex, diagnosis, mean platelet volume and outcome. The outcome was taken as either death of the patient (referred to as ‘expired’) or the

patient being shifted out to the ward (referred to as 'shifted to the ward'). Patients admitted into the Medical ICU who satisfy inclusion and exclusion criteria were taken as study subjects. Written consent was be obtained from all patients (or relatives if the patient is not in a condition to give consent) participating in the study. Patients included in the study were evaluated with detailed history, clinical examination, investigations as per the proforma. Their details and lab results were recorded. Clinical details of the patient were followed upto the occurrence of outcome (Expired or Shifted out to the ward). Patients were divided in to 2 groups of equal numbers according to their out come.

Data entered in Microsoft Excel and analysed using SPSS software. Quantitative variables are expressed in mean with standard deviation. Qualitative variables are expressed as proportions or percentages. The statistical techniques used for analysis include mean, standard deviation and test of significance in difference. in the study. Patients included in the study were evaluated with detailed history, clinical examination, investigations as per the proforma. Their details and lab results were recorded. Clinical details of the patient were followed upto the occurrence of outcome (Expired or Shifted out to the ward). Patients were divided in to 2 groups of equal numbers according to their out come.

Results

Table 1: Demographic details of patients

Sex	Count	N %
Male	195	65.0%
Female	105	35.0%

Among this study 65% are male patients and 35% are female patients. The same has been represented below

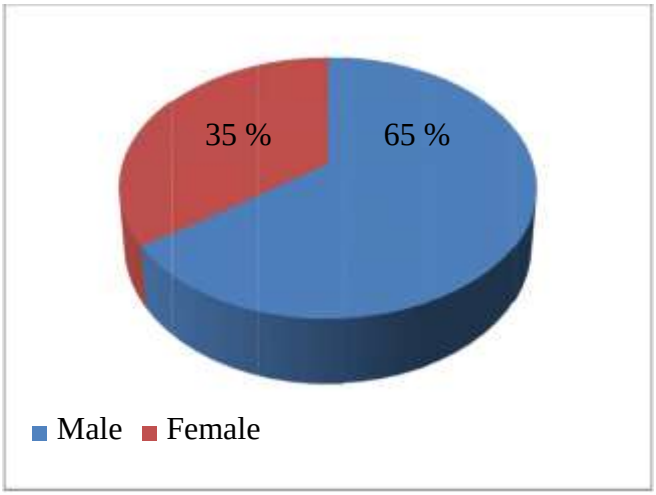

Figure 1: Demographic details of patients

Table 2: Group statistics of Shift out patients

	SEX	N	Mean	Std. Deviation	T
MPV Day 1	Male	100	7.663000	1.2695341	0.636
	Female	50	7.975000	1.2612274	p>0.05

Table shows that the t value is not significant 0.636, p>0.05; that means gender is not an influencing factor on the Shift out patients' MPV value

Table 3: Group statistics of Expired patients

	SEX	N	Mean	Std. Deviation	T
MPV Day 1	Male	95	9.120000	1.6108624	0.358
	Female	55	9.334545	1.5291394	p>0.05

Table shows that the t value is not significant 0.358, p>0.05; that means gender is not an influencing factor on the Expired patients MPV values

Table 4: Outcomes and Diagnosis

Diagnosis	Outcome		Total
	Shiftout	Expired	
Cellulitis	5	5	10
Dengue Fever	5	0	5
Gluteal Abscess	5	0	5
Klebsiella Septicemia	0	5	5
Leptospirosis	40	30	70
Pneumonia	35	40	75
Pneumonia, ACS	0	5	5
Pneumonia, UTI	5	10	15
Pneumonia, UTI, ACS	0	5	5
Prostatitis	5	0	5
Puerperal Sepsis	5	0	5
Pyelonephritis	5	0	5
Snake Bite	0	5	5
SBP	5	10	15
Staph Septicemia	5	0	5
UTI	30	15	45
UTI, ACS	0	5	5
UTI, Pneumonia	0	10	10
UTI, Pyelonephritis	0	5	5
Total	150	150	300

Table 5: Data and result of test of significant difference in the mean age of Expired and Shift out patients

	Outcome	N	Mean	Std. Deviation	t	Significance
AGE	Expired	150	64.00	14 941	1.3 5	P>0.05
	Shift out	150	58.00	16 154		

Above table shows that the obtained t value 1.3 5, p>0.05; that means there is no significant difference in the mean age of Expired and Shift out patients.

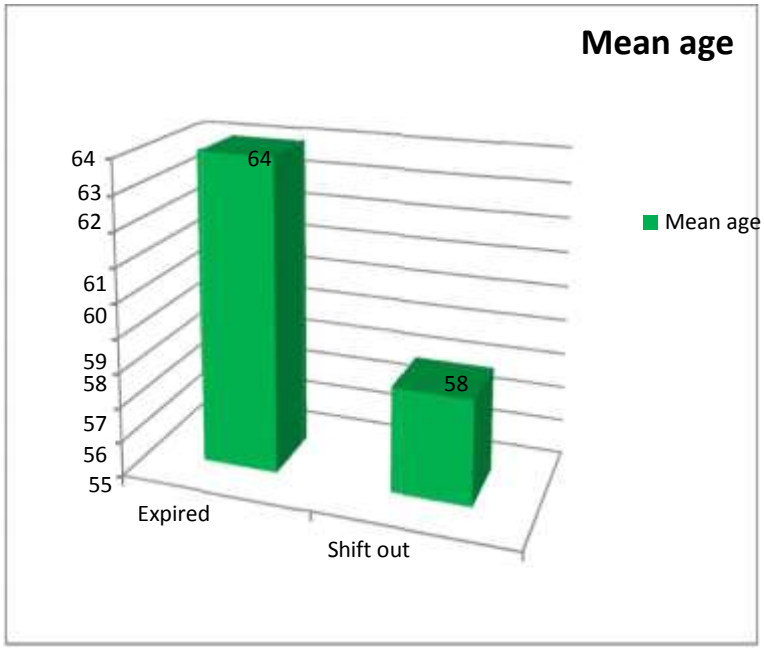

Figure 2: Mean age of Expired and Shift out patients

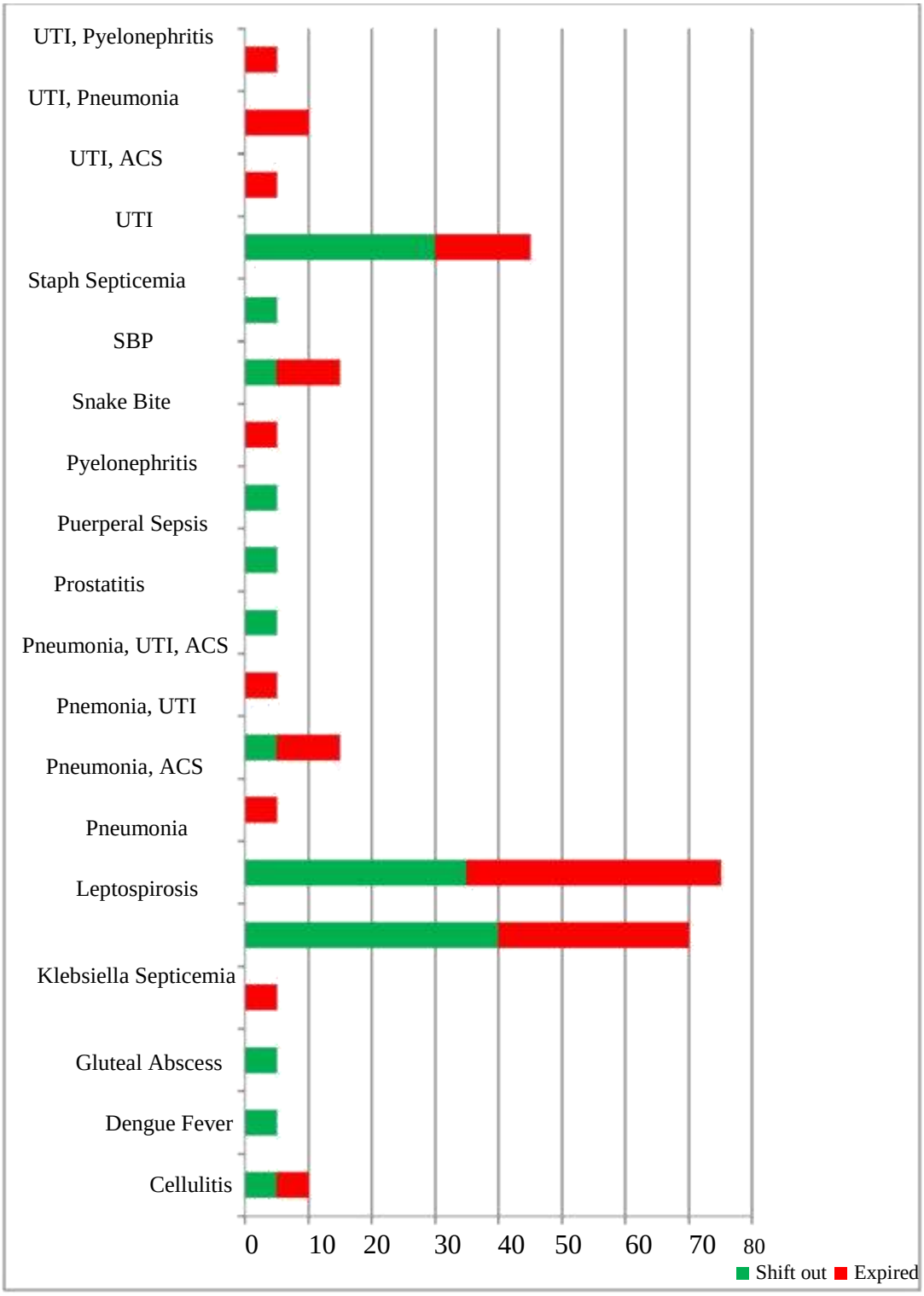

Figure 3: Outcomes and Diagnosis

The most common reason for admission was Pneumonia (110 patients) followed by Leptospirosis (70 patients).

Table 6: Data and result of test of significant difference in the mean MPV Day 1 between Expired and Shift out patients

	Outcome	N	Mean	Std. Deviation	t	Significance
AGE	Expired	1 50	9.1986	1.5 581	3.92	p<0.0 1
	Shift out	1 50	7.767	1.2 537		

Above table shows that the obtained t value 3.92 is greater than the critical value 2.58; p<0.01, that means there exists a significant difference in the MP V Day 1 between Expired and Shift out patients

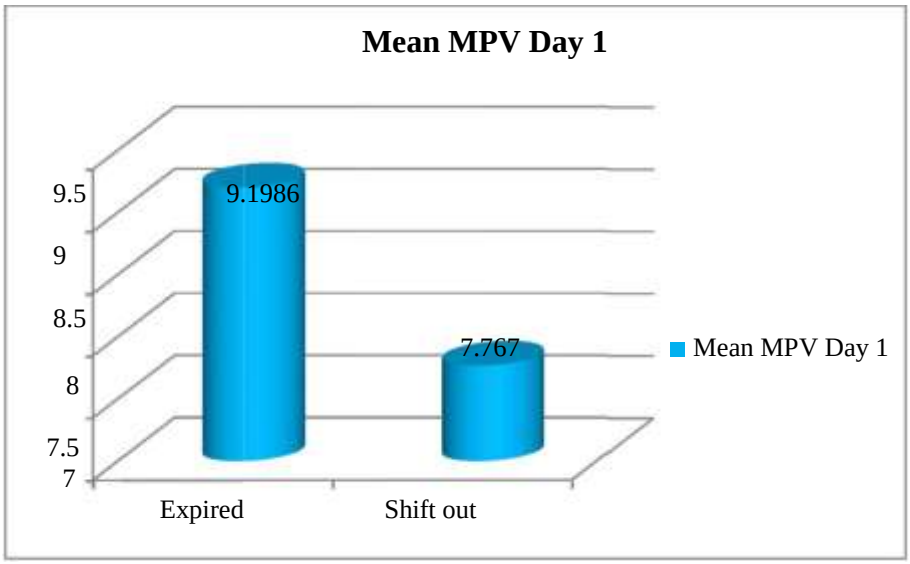

Figure 4: Mean MPV Day 1 of Expired and Shift out patients

Table 7: Data and result of test of significant difference in the mean of Highest MPV between Expired and Shift out patients

	Outcome	N	Mean	Std. Deviation	t	Significance
AGE	Expired	15	0	9.713	4.37	p:<0.01
	Shift out	15	0	8.171		

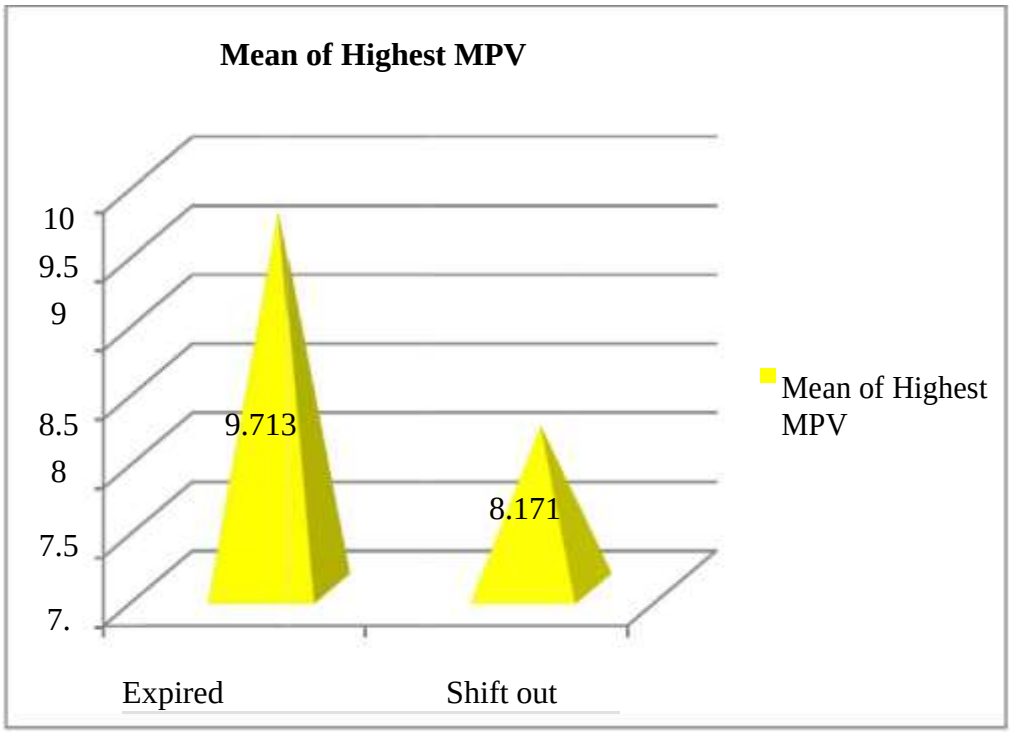

Fig.-5-Mean of the Highest MPV of expired and shiftout patient

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