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EFFECT OF SEVERE SEPSIS ON PLATELET COUNT AND THEIR INDICES" IN A TERTIARY CARE HOSPITAL IN MEERUT CITY

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ABSTRACT
Background: - A serious illness that affects practically all organs and systems is sepsis. A negative impact is also felt on the hemostatic system. **Objectives:** - To examine platelet count and indices. **Methods:** - Selected patients were those who met the criteria for sepsis at a preliminary examination by a specialist in infectious diseases. The control group was chosen from consecutive patients who were admitted to the out-patient clinical but had no infectious disease diagnosis. **Results:** - The commonest age group was in 41-60 years age group (16 out of 50 cases), 32% Followed by 21-40 years (14 out of 50 cases), 28%. **Conclusion:** - In the present study, it is concluded that the frequency of platelet indices such as platelet count, mean platelet volume, platelet distribution width, plateletcrit, and immature platelet fraction helps in discriminating the etiological cause for thrombocytopenia.

KEYWORDS : Severe sepsis, thrombocyte, thrombocytopenia, Mean Platelet Volume, Platelet

INTRODUCTION

Millions of people worldwide are impacted by sepsis each year. In the United States (US), sepsis affects about 750,000 people a year and kills 215,000 people.[1] The cost of this illness to the US economy in one year was 16.7 billion dollars.[2] Sepsis affects almost all organs and systems. A negative impact is also felt on the hemostatic system. In the pathophysiology of sepsis, clotting cascades are inactive, mononuclear and endothelial cells release a large number of pro- and anti-inflammatory cytokines, thrombus develops later, and the fibrinolytic system is stimulated by plasminogen and activated by antithrombin-III.[3] The function of platelets in blood coagulation is crucial. When there is a wound or injury, platelets gather and form an aggregate. The normal range of platelet count in adults is 150,000-400,000/L. A higher platelet count is observed in women than men.[4]

Low platelet counts have symptoms like Bruising: red, purple, or brown, petechiae, rash with small red or purple dots on the skin, nose bleeds, bleeding gums, bleeding from wounds for a prolonged period or doesn't stop on its own, heavy menstrual bleeding, and in more serious cases, internal bleeding also occurs in urine, stool, rectum and sometimes in the brain also.[5] Platelets play an important role in hematological diseases. In the past morphology and extent of distribution of platelets were measured. Platelet count, platelet volume (MPV), platelets distribution width (PDW), plateletcrit (PCT), and a platelet large cell ratio (PLCR) were studied in diagnosing hematological diseases.[6] Platelets are a small, non-nucleated component of blood. These formed blood elements are seen as fragments, forming the cytoplasm. A higher platelet count is observed in women than men. Approximately 40% of patients with severe sepsis have a platelet count below 80,000/mm[7]. The platelet count decreases with the severity of infection. Platelets or thrombocytes are the building blocks of blood.

MATERIALS AND METHODS

The retrospective study was carried out in the Department of Pathology, Subharti Medical College and associated Chhatrapati Shivaji Subharti Hospital, Meerut, over a period of Six month (from April 2021 - September 2021).

Ethics Approval

Approval by the institutional ethics committee was taken before conducting the study. The study group included all the patients from various inpatient units and outpatient departments, irrespective of age and gender.

Methodology:

Figure 1:- Photograph- (HORIBA ABX Pentra/XLR)

The venous blood sample collected in a tube containing di-potassium EDTA which came for routine CBC (complete blood count) were analyzed and those sample with platelet count less than 1,50,000 cells/cumm were selected for the study

- The relevant clinical details and available investigations, including serological results of the patient with thrombocytopenia were then collected from the patient
- Platelet indices such as platelet count, plateletcrit (PCT), platelet distribution width(PDW), and mean platelet volume(MPV) were then measured in an automated blood cell analyzer (HORIBA ABX pentra/XLR, Fig-1) and then analyzed and correlated with the peripheral smear findings
- By observing clinical findings with platelet indices, thrombocytopenia patients were categorized into hypoproductive and hyperdestructive groups based on the predominant mechanism of thrombocytopenia.

Statistical Methods:

- Descriptive statistics such as numbers and percentages were used to describe categorized variables
- Mean and standard deviations were used to describe the continuous variables like platelet count, MPV, PDW, PCT
- An independent sample t-test was applied to find out the significant difference in platelet count, MPV, PDW, and PCT in both groups
- Pearson's coefficient was used to analyze the association between the variables

- Statistical significance was determined at a 5% level of significance (ie. p-value <0.05 is considered as significant)
- Statistical analysis was done using a statistical package for social software (SPSS version 19)

Table 1:- Normal reference ranges of various hematological parameters taken according to the different age groups are as follows.85

Hematological Parameter	>12 years	1-12 years	1month-1 year	<1 month
HGB (g/dl)	12-17.4	13-15.5	11-14	13.5-20
HCT (%)	36-52	33-45	28-55	39-65
RBC (x 106 /mm3)	4.0-5.5	4.1-5.2	3.1-5.5	3.6-5.9
MCV (fl)	80-100	71-95	68-112	88-123
MCH (pg)	28-34	24-33	24-36	30-37
MCHC (g/dl)	32-36	32-37	28-37	28-36
TLC(x 103/mm3)	4-11	5-16	5-18	6-26

Table 2:- The reference range of RDW, MPV, PCT, and PDW are the same for all age groups.85

| Hematological parameter	Range
RDW (%)	11.5-14.5
MPV (fl)	6.8-10.2
PCT (%)	0.150-0.500
PDW %	9-15

RESULTS

- The study was cross sectional observation study was conducted in the department of pathology, Subharti Medical College, and associated Chhatrapati Shivaji Subharti Hospital, for a period of 6 months from April 2021 to September 2021.
- The commonest age group was in 41-60 years age group (16 out of 50 cases), 32% Followed by 21-40 years (14 out of 50 cases), 28%.
- Among the 50 thrombocytopenic patients, 25 patients were males and 25 were females. Further, they were divided into two group hypo productive and hyper destructive thrombocytopenia.
- Out of total 22 cases hypo productive thrombocytopenia patients, 10 were female and 12 were males, whereas out of total 28 hyper destructive thrombocytopenia patients, 15 were females and 13 were males.
- Male: female ratio in hypo productive & hyper destructive group is 1:2:1 & 0.86:1 respectively.
- The platelet counts were analyzed in two groups. The mean platelet count in hypo productive thrombocytopenia is 82.4091 ± 35.65397 and in the hyper destructive group is 89.3214 ± 41.23829 which is statistically insignificant.
- The mean platelet volume in the hypo productive group is 10.5318 ± 1.61020 and in the hyper destructive group is 11.4393 ± 1.41378 which is statistically significant.
- The mean PCT in the hypo production group is 0. 07 78 ±.0.05923 and in the hyper destructive group is 0.0758 ± .0.05261 which is statistically insignificant.
- The mean PDW in the hypo production group is 22.3864 ± 6.11558 and in the type destruction group is 25.1750± 6.41524 which is statistically insignificant.
- Along with the platelet count, platelet indices such as MPV, PCT, and PDW were measured and analyzed using unpaired t-test at 5 % level of significance in hypo productive and hyper destructive groups.
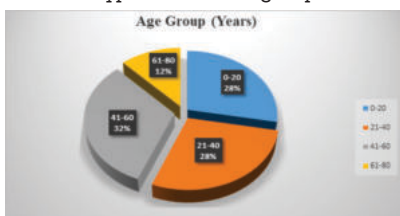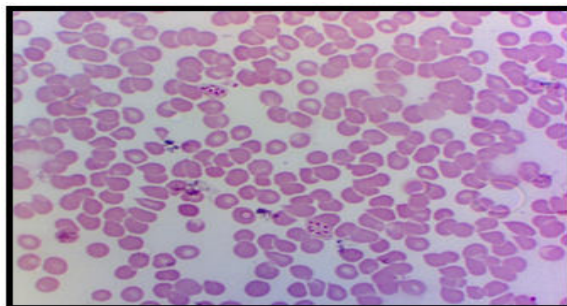

Figure2:- Age- Wise Distribution

Table 3:- Gender Wise Distribution In Both Groups

Gender	Hypoproductive	Hyperdestructive
Female	10	15
Male	12	13
Total	22	28
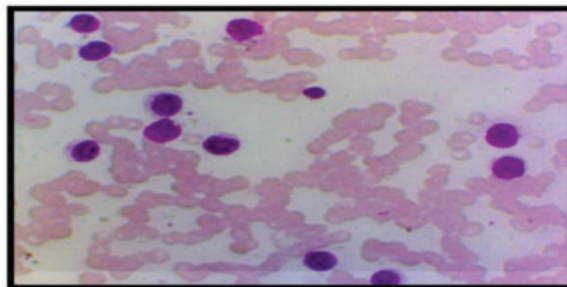
Figure 3:- Photomicrograph PBS of leukemia patient showing immature cells and thrombocytopenia (Lishman stain, 40x)

Figure 4:- Photomicrograph PBS of malaria patient showing (p.vivax arrow↑↑) and thrombocytopenia (Lishman stain, 40x)

DISCUSSION

In our study a total of 50 cases were observed. The age group of patients included in the study was 1 to 80 years. Majority of patients were seen in 41 to 60 years age group (32%) followed by 21-40 years (28%) which is comparable to the study done by Peddavernnagari T et al.[8]

A total of 50 cases were studied in present study out of which 50% were female & 50% were male. In hypoproductive group, 12 (54.5%) were male and 10 (45.5%) were female which is similar to the results of Peddavernnagari T et al.[8]

Male: female ratio was 0.86:1 in hyperproductive groups in our study however the observed ratio was 1.1:1 by Peddavernnagari T et al.[8]

In our study the most common etiology was anemia (18/22) in hypoproductive group and sepsis (14/28) in hyperdestructive group. This is in concordance with the study done by Peddavernnagari T who observed megaloblastic anemia as the most common etiology for hypoproductive cases; however the most common cause for hyperdestructive thrombocy topenia was immune thrombocytopenia.

In studies done by Elsewefy et al[9], Khaleel et al[10], Khairkar et al[11], Kaito et al[12] Parveen et al[13], the platelet count showed no statistically significant correlation among the two groups and the present study findings are consistent with the results of these studies, as in the present study also Platelet count showed no statistically significant correlation between both the groups.

Mean platelet volume (MPV) acts as an indicator of the activity of platelets. Studies by Ntaios et al[14], Khairkar et al[11], Parveen et al[13]and showed higher MPV in hyperdestructive group than

the hypoproductive group. In a study by Kaito et al[12], MPV was significantly higher in immune thrombocytopenic purpura than aplastic anemia.

In a study by Elsewefy et al[15] and Khaleel et al[10] also, MPV was found to be higher in the hyperdestructive group when compared to the hypoproductive group. Results of the Analysis of MPV in the hypoproductive and the hyperdestructive group agree with the results of studies by Ntaios et al, Parveen et al, Khairkar et al, Khaleel et al and Elsewefy et al.

Limitations Of The Study

Our study has a number of limitations, such as the need for studies with a bigger sample size. Although there is a strong correlation between platelet indices and sepsis mortality, this study does not adequately explain any underlying cause-and-effect interactions. Each patient's unique therapy choices have an impact on outcomes that cannot be fully studied. Since this was a retrospective study, a number of variables may have been uncontrollable or inconsistent. It was not possible to assess the patients' 28-day death data or long-term survival results in this investigation. A prospective research design permits more thorough and careful data management and collection. Prospective studies with bigger patient groups are required to more robustly control for all potential confounding factors.

CONCLUSION

In the present study, it is concluded that the frequency of platelet indices such as platelet count, mean platelet volume, platelet distribution width, plateletcrit, and immature platelet fraction helps in discriminating the etiological cause for thrombocytopenia. Among the platelet indices, mean platelet volume (MPV p- value<0.039), provides much more reliable results in distinguishing both study groups.

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