Thrombocytopenia in Patients with Sepsis

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Abstract: _Background: Thrombocytopenia has been observed to be associated with sepsis and present as an early finding in septic patients. Host defense against infection is a product of dual mechanism: the inflammatory response and the activation process of coagulation. The platelets play vital role in both haemostasis and immune response. The above mechanisms work hand in hand in a synchronous and complex manner making the contribution of platelets crucial in sepsis._ _Aim and Objective: The aim of our study is to show presence of thrombocytopenia in patients with sepsis in various age groups and degree of severity of thrombocytopenia. To establish use of thrombocytopenia as a cost effective and easily available biomarker for early detection of sepsis to reduce mortality._ _Material and Methods: An observational study was conducted at Department of Pathology, SIMS, Hapur in which a total of 150 patients which were septic (TLC >12, 000/cumm) were included in this study._ _Results: In our study a total of 150 patients with sepsis (TLC > 12, 000/cumm) and thrombocytopenia were taken into account, in which we observe that 13.33% (n= 20) septic patients have mild thrombocytopenia (platelet count of 1, 00, 00 - 1, 50, 000/ cumm) out of which 6 are female and 15 are male. A total of 76 patients (50.66%) have moderate thrombocytopenia (platelet count of 50, 000 - 99, 000/cumm) out of which 49 are female and 27 are male. When observed, 54 patients with sepsis (36.01%) have severe thrombocytopenia. Out of 54 patients, 42 are female and 12 patients are male.64.66% of patients studied are female._

Keywords: Thrombocytopenia, sepsis, platelet function, Biomarkers, coagulation cascade

1. Introduction

Thrombocytopenia is defined as condition characterised by abnormally reduced levels of platelets in blood—a major component of clotting and coagulation cascade. It can occur due to multiple factors such as medications, infections, autoimmune diseases, and other health conditions (1).

Thrombocytopenia can lead to various symptoms like mild bruising and bleeding to even moderate to extensive symptoms or may result in severe complications such as an increased risk of stroke, heart attack, or death (1). Investigating the sources and exploring the effective treatments for thrombocytopenia are vital for improving patient prognosis and quality of life.

Sepsis is excessive inflammatory response of body to infection leading to life threatening conditions. Sepsis has been identified as a threat to adults as well as children by many health organisations. It has been seen that there is a significant rise in incidence—8.7% in the recent times, due to exaggerated response of body to infections (2). Defective coagulation can cause sepsis - related mortality ranging from mild thrombocytopenia to fatal conditions like disseminated intravascular coagulation (DIC) (3). Platelets are crucial in sepsis, and thrombocytopenia has dual importance of a prognostic marker as well as an independent predictor of worse outcomes (4). On a significant note, thrombocytopenia during septic conditions is associated with increased mortality (6). Furthermore, platelets have the potential to be therapeutic targets and modulators of sepsis (7), highlighting the significance of understanding thrombocytopenia in sepsis.

Thrombocytopenia is a major haematological profile change in sick patients. A series of complex mechanisms and processes contribute to thrombocytopenia during sepsis. Increased consumption of platelets due to infections, thrombosis or immune mediated can lead to thrombocytopenia (8). Dysregulated host responses, interactions with platelet receptors and complexes, and immune - mediated thrombocytopenia are among the discovered mechanisms (9). Having in depth knowledge of these mechanisms is vital for developing appropriate treatment strategies.

This study was carried out with an aim to evaluate role of thrombocytopenia as an early biomarker in sepsis and to find the prevalence of thrombocytopenia across the various age groups and gender in patients with septic conditions.

2. Material and Methods

This study was conducted at the Department of Pathology, Saraswathi Institute of Medical Sciences, Hapur. A total of 150 patients with sepsis and thrombocytopenia on hematological profile after admission in the period of September 2022 to November 2023 are taken into account. This study included both male and female.

The following parameters were done:

Blood sample was collected in purple to vaccutainer with EDTA and haematological analysis for total leucocyte count (TLC) and platelet count (PC) was done on automated analyser. Further leucocyte count and platelet count was done on peripheral blood smear which was prepared using Giemsa stain.

Table 1: Reference ranges

S. No.	Parameters	Reference Range
1	Total Leucocyte Count (TLC)	Normal - 4, 000 - 11, 000 / cumm Leucocytosis - > 12, 000/cumm
2	Platelet count	Normal - 1, 50, 000 - 4, 50, 000/cumm Thrombocytopenia: Mild - 1, 00, 000 - 1, 50, 000/ umm Moderate - 50, 000 - 99, 000/cumm Severe - <50, 000/cumm

Table 2: Incidence of thrombocytopenia in both genders in various age groups

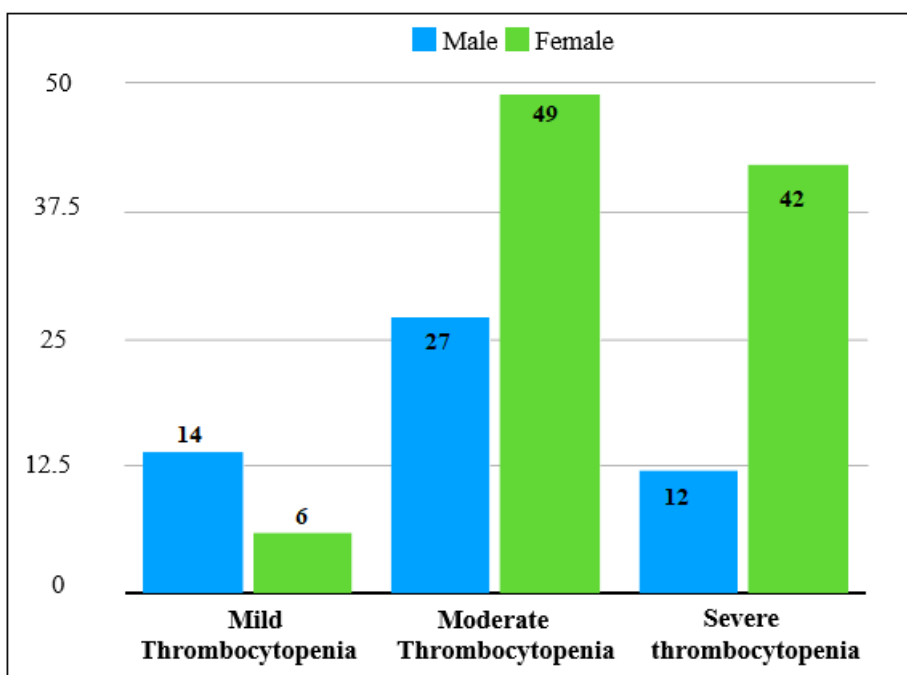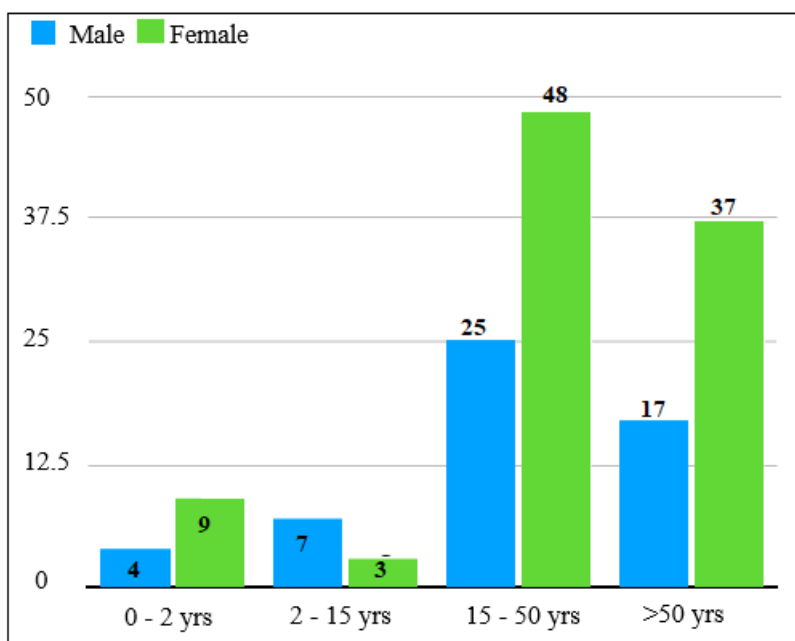| Age	Male	Female	Male	Female	Male	Female
0 - 2 YRS	2	2	2	5	0	2
2 - 15 YRS	3	0	3	2	2	1
15 - 50 YRS	6	3	13	27	6	18
>50 YRS	3	1	9	15	4	21

Chart 1: Incidence of thrombocytopenia in males and females

No. of male and female in septic patients with thrombocytopenia of various age groups

3. Review of Literature

1) A study conducted by Vardon Bounes F et al concluded that platelets play important role in infection state and are involved in various mechanisms to promote the immune response and the activation of coagulation cascade.

Thrombocytopenia is common in the ICU during sepsis, causes are multifactorial, and low platelet count is correlated with a poor outcome. A deeper understanding of platelet activation mechanisms and link between endothelial cells, immune cells, and pathogens would provide the perspective to target several deleterious pathways in sepsis, particularly in platelet activation. [10]

2) Another study held at Mamta Medical College and Hospital, Khamman, Telangana show that thrombocytopenia acts as an early predictor of neonatal sepsis and also crucial in outcome of disease in neonates. Platelet count in adjuvant to clinical correlation can be used to suspect early sepsis to provide timely and appropriate treatment. [11]

3) Beyhekim Training and Research Hospital, Clinic of Intensive Care Unit, Konya, Turkey conducted a study on 299 patients and concluded that thrombocytopenia which is commonly seen in ICU's and especially in the septic patients is associated with mortality and morbidity and prognosis of disease. [12]

4. Result and Discussion

4.1 Result

In our study a total of 150 patients with sepsis (TLC > 12, 000/cumm) and thrombocytopenia were taken into account, in which we observe that 13.33% (n= 20) septic patients have mild thrombocytopenia (platelet count of 1, 00, 00 - 1, 50, 000/ cumm) out of which 6 are female and 15 are male. Mild thrombocytopenia in various age groups i. e.0 - 2 years (n=4), 2 - 15 years (n=3), 15 - 50 years (n=9) and > 50 years of age group (n=5) has been observed. A total of 76 patients (50.66%) have moderate thrombocytopenia (platelet count of 50, 000 - 99, 000/cumm) out of which 49 are female and 27 are male, furthermore on evaluating age groups n=7 fall in group of 0 - 2 years, n=5 in 2 - 15 years, n=40 in 15 - 50 years and n=24 in >50 years of age group. When observed, 54 patients with sepsis (36.01%) have severe thrombocytopenia. Out of 54 patients, 42 are female and 12 patients are male. On observing the age groups number of patients are respectively, 0 - 2 years (n=2), 2 - 15 years (n=3), 15 - 50 years (n=24) and >50 years (n=25). 64.66% of patients are female.

4.2 Discussion

Sepsis is one of major disease faced in a hospital setup specially in ICU. Various biomarkers like TLC, ESR, CRP, ANC are used for detecting and estimation of disease severity and blood culture is gold standard for diagnosis but prolonged result time comes as a major limitation for the test. In recent times, platelet count is emerging as a new and early biomarker for diagnosis and outcome estimation of sepsis. In our study we have taken 150 septic patients that had thrombocytopenia in first lab investigations after hospital admission. Our aim in the study was to establish presence of thrombocytopenia in septic conditions in variable age groups. We observe that maximum number of patients have moderate thrombocytopenia (PC= 50, 000 - 99, 000/cumm) and that too more prevalent in age group of 15 - 50 years of age. In age group of 2 - 15 years, overall incidence of thrombocytopenia is low. Thrombocytopenia in septic patients is a product of inflammatory response and coagulation activation. In younger age group due to good immunity response to sepsis is better and therefore presence of thrombocytopenia is on a lower side. It is also remarked in our study that females are predominantly more affected. A good population of patient fall under category of severe thrombocytopenia with mostly being females. Memon F P et al in their study concluded that It was concluded that thrombocytopenia is a good marker for adverse outcome among septic mothers. Maternal morbidity and mortality was higher among septic women with thrombocytopenia [13]. Improved platelet counts signify towards better treatment outcomes in septic patients. Thiery - Antier N et al show that thrombocytopenia is a prognostic marker of survival within the first 24 hours of septic shock onset at day 28 in a large cohort of ICU patients. Measuring platelet count is cost effective and feasible for the physician in routine practice, and thus, it could represent an easy "alert system" among patients in septic shock.

5. Conclusion

We conclude that thrombocytopenia in sepsis is most prevalent in patients of age 15 - 50 years and females being predominantly more affected. Major group of patients have moderate degree of thrombocytopenia. Use of thrombocytopenia as an early biomarker in patients with sepsis on admission can improve prognosis of disease.

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