International Journal of Research in Medical Sciences
Muhammed Safwan K. S et al. Int J Res Med Sci. 2024 Sep;12(9):3244-3248
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20242598

Original Research Article

A clinicopathological evaluation on thrombocytosis in correlation with platelet indices in a tertiary care hospital: a retrospective study

Muhammed Safwan K. S., Prajna K. M.*, Chaithanya Ullas

Yenepoya School of Allied Health Sciences, Mudipu Campus, Kurnad Post, Mangalore Karnataka, India

Received: 01 July 2024
Accepted: 12 August 2024

***Correspondence:**
Prajna K. M.,
E-mail: prajnakanakkoor@gmail.com

ABSTRACT

Background: Thrombocytosis refers to platelet count >450×109/l in the peripheral blood. It is classified into primary and secondary forms. An increased platelet count has emerged as a significant clinical issue for the differential diagnosis of numerous physiological and pathological conditions. This study was done to evaluate the clinical study on patients with thrombocytosis in correlation with platelet indices.
Methods: This was a retrospective study which included 105 subjects. EDTA samples were collected from thrombocytosis patients for the estimations of platelet indices. The severity of thrombocytosis was grouped as Mild, Moderate, Severe and Extreme. The results were analysed using SPSS Software.
Results: Commonly encountered etiological findings were secondary thrombocytosis (97.14%). Correlation in between the various platelet indices, the PCT was positively correlated with PLT count as well as MPV, and the PDW was positively correlated with MPV as well as PCT. According to the severity of thrombocytosis, significant difference was observed with PLT count and PCT, no statistical significance was observed in MPV or PDW.
Conclusions: The study found that secondary thrombocytosis was the main etiological factor for thrombocytosis, which is primarily driven by respiratory tract infections, gastrointestinal tract infections, urinary tract infections, and other infections (bacterial infections and viral infections). Platelet indices such as PLT count and PCT showed statistical significance with the severity of thrombocytosis and no statistical significance in MPV and PDW.

Keywords: Thrombocytosis, Platelet indices, Severity, Secondary thrombocytosis, Infections

INTRODUCTION

A platelet count over the normal range, or more than 450×109/l is referred to as thrombocytosis in peripheral smear. Thrombocytosis is now more frequently discovered as an unexpected discovery due to the widespread usage of electronic cell counters and the consequent availability of a platelet count as part of a "routine" blood count.[1,2] As a result, a high platelet count has emerged as an important clinical issue for the differential diagnosis among many pathological and physiological processes.[3] According to its origin, thrombocytosis is classified into primary and secondary forms.[4] Primary thrombocytosis (clonal) is a myeloproliferative disease caused on by monoclonal or polyclonal abnormalities of hematopoietic cells or by abnormalities in the biology of thrombopoietin.[5] Secondary thrombocytosis (reactive) causes various conditions like inflammation, infection, iron deficiency, hemolysis, tissue damage, malignancy, severe exercise, hypersplenism, and other causes of an acute phase response.[6] After peripheral smear detection and confirmation of thrombocytosis, the diagnostic evaluation shifts to determining whether the condition is reactive or clonal in nature. Understanding the underlying factors that cause thrombocytosis is a significant first step in this.[3] The study aims to perform clinical study on patients with thrombocytosis in correlation with platelet indices. Objectives were to identify the etiology of thrombocytosis with clinical correlation. To analyses the

platelet indices (platelet count, mean platelet volume, plateletcrit, platelet distribution width) in relation to thrombocytosis. To compare the platelet indices with the degrees of severity of thrombocytosis.

METHODS

This retrospective observational study was done on 105 subject's data with platelet counts above 4.5 lakh/mm3 who were having primary and secondary thrombocytosis. The thrombocytosis was grouped into Mild, Moderate, Severe and Extreme Severity of Thrombocytosis. Data was obtained from computerized records from the Central Laboratory and Medical Records department of Yenepoya Medical College Hospital, Derlakatte, Mangalore, with prior permission by anonymizing the patient identity, from May 2023 to May 2024 were included in the study. Platelet indices such as platelet count, mean platelet volume, plateletcrit and platelet distribution width and etiological conditions of the patient's data were studied having thrombocytosis in the IPD included in the study. The Patients with a coagulation disorder, Concurrent illness recent use of any kind of vitamin K antagonist were excluded from the study. Venous blood was collected in EDTA Vacutainers tube for complete blood count tests to obtain the platelet indices were analyzed by using automated SYSMEX XN-1000 hematology analyzer.

Statistical analysis

Data was entered into Microsoft excel data sheet and data was analysed using SPSS software by simple random sampling technique. The collected data were summarized by using descriptive statistics; mean and standard deviation is used for continuous variables, frequency and percentage are used for categorical variables. The One-way ANOVA was used to compare platelet parameters according to the severity of thrombocytosis. To find the relation between various platelet parameters; the Pearson correlation coefficient ("r") was used. The p value<0.05 was considered as significant.

RESULTS

The study was conducted in Yenepoya Medical College Hospital Laboratory, Derlakatte, Mangalore over a period of one year from May 2023 to May 2024. A total of 105 subjects were included in the study, out of which 54 were males with 51% and 51 were females with 48.6% (Figure 1). In this study, the youngest patient was about 1 month of age and the oldest was 79 years. The severity of thrombocytosis is classified based on the platelet count into Mild (500-699×109/l), Moderate (700-899×109/l), Severe (900-999×109/l) and Extreme thrombocytosis (>1000×109/l) with 77.1%, 16.2%, 1.9% and 4.8% respectively (Figure 2). Table 1 shows the mean values of platelet indices which includes PLT count was 641.57×109/L, MPV was 9.31 fl, PCT was 0.60%, and PDW was 9.78 fl. The One-way ANOVA was used to compare platelet indices according to the severity of thrombocytosis. There was a significant difference (p<0.05) in PLT (Mcl) as well as in PCT (%) among the different grades of thrombocytosis (Table 2).

Table 1: Descriptive statistics for platelet indices.

Platelet indices	Range	Mean	S.D.
PLT	500 to 1286	641.57	160.83
MPV	7.8 to 11.6	9.31	0.78
PCT	0.42 to 1.42	0.60	0.15
PDW	7 to 17	9.78	1.72

Table 2: Comparison of platelet indices according to the severity of thrombocytosis.

Platelet indices		Mean	S.D.	"F"	P value
PLT (MCL)	Mild (500-699)	570.2	52.6	262.03	<0.001*
	Moderate (700-899)	789.5	51.8		
	Severe (900-999)	949.5	21.9		
	Extreme (>1000)	1172.4	101.9		
MPV (FI)	Mild (500-699)	9.37	0.76	1.06	0.369
	Moderate (700-899)	9.05	0.7		
	Severe (900-999)	8.8	0.14		
	Extreme (>1000)	9.32	1.35		
PCT (%)	Mild (500-699)	0.53	0.07	111.74	<0.001*
	Moderate (700-899)	0.71	0.06		
	Severe (900-999)	0.84	0.04		
	Extreme (>1000)	1.09	0.2		
PDW (fL)	Mild (500-699)	9.85	1.61	2.06	0.11
	Moderate (700-899)	9.18	1.15		
	Severe (900-999)	8.75	0.5		
	Extreme (>1000)	11.12	3.82		

("F" = One way ANOVA; * Significant)

The Pearson correlation coefficient ("r") was used to find the relation between the various platelet indices. The PCT was positively correlated with PLT count as well as MPV. The PDW was positively correlated with MPV as well as PCT (Table 3). Table 4 shows the classification of patients on the based on the types of thrombocytosis. The most encountered thrombocytosis was secondary thrombocytosis (97.14%) and remaining 2.86% falls on primary thrombocytosis. Table 5 shows the etiology of primary and secondary thrombocytosis. Among 105 subjects, the primary thrombocytosis was observed in 3

individuals. Out of 3 patients, 1 patient with Essential thrombocytosis with JAK-2 mutation and 2 patients with chronic myeloid leukemia. The secondary thrombocytosis was observed in 102 subjects with causes of respiratory tract infection among 34 patients (19.3%), GI tract infection among 12 patients (6.8%), urinary tract infection among 7 patients (4%), and other infections (bacterial infections and viral infections) among 58 patients (33%).

A significant incidence of both primary and secondary thrombocytosis was observed in cough among 32 patients (12.1%), breathlessness among 15 patients (5.7%), abdominal pain among 8 patients (3%), chest pain among 6 patients (2.3%), and miscellaneous symptoms respectively (Table 6).

Table 3: Correlation between the various platelet indices.

		PLT	MPV	PCT	PDW
PLT (Mcl)	"r"	1	-0.107	0.933	0.033
	p value	-	0.277	< 0.001*	0.735
MPV (Fl)	"r"		1	0.237	0.904
	p value		-	0.015*	<0.001*
PCT (%)	"r"			1	0.354
	p value			-	<0.001*
PDW (fl)	"r"				1
	p value				-

("r" = Pearson correlation coefficient; * Significant).

Table 4: Classification of patients on the basis of type of thrombocytosis.

Classification of patients based on type of thrombocytosis	Frequency	%
Primary thrombocytosis	3	2.86
Secondary thrombocytosis	102	97.14

Table 5: Etiology of thrombocytosis.

Etiology	Frequency	%
Etiology of secondary thrombocytosis		
Essential thrombocytosis with JAK-2 mutation	1	0.6
Chronic myeloid leukaemia	2	1.1
Etiology of primary thrombocytosis		
Acute kidney injury	4	2.3
Anaemia	3	1.7
GI infection	12	6.8
Iron deficiency anaemia	6	3.4
Nephrotic syndrome	4	2.3
Other infection (Bacterial and Viral)	58	33
Respiratory tract infection	34	19.3
Tuberculosis	6	3.4
Urinary tract infection	7	4
Others	3	1.7

Table 6: Clinical details of thrombocytosis.

Clinical details	Frequency	%
Abdominal distension	4	1.5
Abdominal pain	8	3
Amenorrhoea	3	1.1
Breathing difficulty	3	1.1
Breathlessness	15	5.7
Burning micturition	2	0.8
Chest pain	6	2.3
Cough	32	12.1
Others	3	1.1

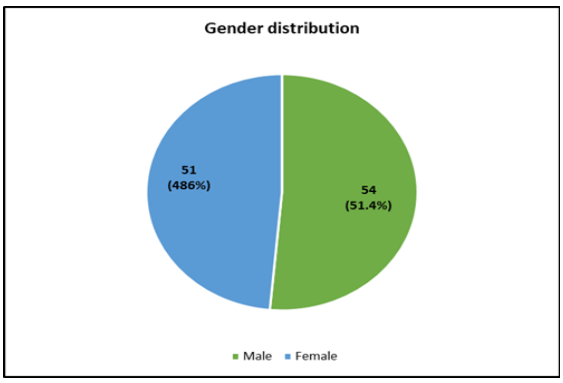

Figure 1: Graphical representation of gender.

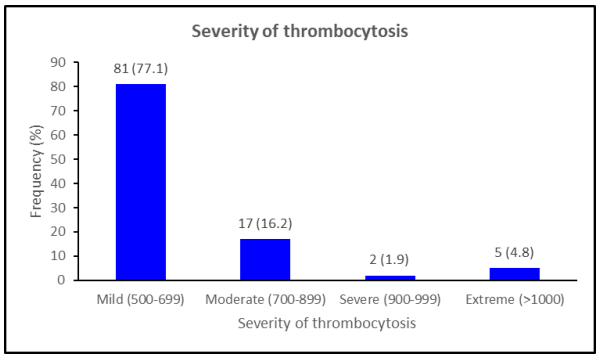

Figure 2: Graphical representation of severity of thrombocytosis.

DISCUSSION

In this study, the majority of the patients suffering from thrombocytosis were found to be 54 in male (51.4%) and 51 in female (48.6%), a similar observation was also seen in previous study.3 majority of patients were range in between 1 month to 79 years. 105 patients with a platelet count of more than 450×109/l were included and the elevated platelet count of 3 patients (2.86%) was a result of primary thrombocytosis, whereas the elevated platelet count of 102 patients (97.14%) were suffering due to secondary thrombocytosis, similar findings were observed in previous studies.[3,4]

The majority of patients had mild thrombocytosis (77.1%) with platelet count >500-699×109/l, similar observation was also seen in previous study.[15] The correlation between the various platelet indices among thrombocytosis patients, the platelet crit was positively correlated with platelet count as well as mean platelet volume, and the platelet distribution width was positively correlated with mean platelet volume as well platelet crit. The contrasting results were also obtained by a previous study who reported it as absolute value of mean platelet volume and platelet distribution width have no correlation with respect to platelet count.[20] The chronic myeloid leukemia among 2 patients (1.1%) followed by essential thrombocytosis with JAK-2 mutation in one patient (0.6%) was the main causes of primary thrombocytosis. The infections among 58 patients (33%) mainly bacterial and viral infections were the main causes of secondary thrombocytosis followed by respiratory tract infection in 34 patients (19.3%), gastrointestinal tract infection in 12 patients (6.8%), urinary tract infection in 7 patients (4%). Other study had similar etiological findings, Among 308 patients, respiratory tract infection was seen in 182 patients (59.09%), gastrointestinal tract infection in 55 patients with (17.86%), urinary tract infection among 21 patients (6.82%) and other infections mainly among 50 patients (16.23%).[4] Other study also found that the respiratory system was responsible for the greatest number of cases (38%) in secondary thrombocytosis followed by the gastrointestinal tract, central nervous system, and genito-urinary tract.[22]

Thrombocytosis is a frequent finding in lower respiratory tract infections, showing particular prominence in cases of pneumonia, and in our study, it is also found that respiratory tract infection in 34 patients (19.3%) with secondary thrombocytosis. Prevalence of cough, breathlessness, and chest pain was notably high, suggesting a potential association with respiratory tract infections, which emerged as the primary etiology of secondary thrombocytosis in our investigation.

CONCLUSION

The present study concluded that secondary thrombocytosis (97.14%) was the main etiological factor for thrombocytosis which is primarily driven by respiratory tract infections, gastrointestinal tract infections, urinary tract infections, and other infections (bacterial infections and viral infections). The limitation of the study was to involving the factors such as comorbidities or medications, could have influenced the relationship between thrombocytosis and the observed etiological factors. Among the various platelet indices and in relation to thrombocytosis, mean platelet volume and platelet distribution width have no correlation with respect to platelet count, for individuals with secondary thrombocytosis, mean MPV was considered to be normal. A patient who has persistent thrombocytosis may have elevated MPV and PDW, which warrants additional investigation and assessment. Platelet indices in relation to severity of thrombocytosis, PLT count and PCT showed statistically significant in mild, moderate, severe, and extreme severities of thrombocytosis, there was no statistical significance was observed with other platelet indices such as MPV and PDW.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Muhammed Safwan KS, Prajna KM, Ullas C. A clinicopathological evaluation on thrombocytosis in correlation with platelet indices in a tertiary care hospital: a retrospective study. Int J Res Med Sci 2024;12:3244-8.