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A Study Of Platelet Indices In Thrombocytopenia Patients In A Tertiary Care Hospital.

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ABSTRACT

Thrombocytopenia may result from marrow hypoplasia, raised destruction of platelets, and splenic sequestration. The gold standard method for detecting the causes of thrombocytopenia is bone marrow examination, but because of its invasive and expensiveness, an alternative method introduced as a first line of diagnostic procedure, the automated blood cell analyzer with various machine derived parameters, known as platelet indices, which includes the mean platelet volume (MPV), platelet distribution width (PDW), and platelet crit (PCT) are provided a routine part of complete blood count analysis. The objectives of the present study are to investigate the role of platelet volume indices in the differential diagnoses of thrombocytopenia and to study the use of platelet indices in the initial evaluation of these patients. An observational and a prospective study was conducted on 50 patients with thrombocytopenia. The study group was classified into two groups: hypo-productive and hyper-destructive. Platelet indices were recorded and compared in the two groups. The mean of platelet indices, was significantly higher ($p < 0.05$) in the hyper-destructive group [PDW (16.6fl), MPV (12.1fl), P-LCR (42.3%)] as compared to the hypo-proliferative group [PDW (11.8fl), MPV (10.9fl), P-LCR(31.5%)] and the mean values of PDW (14.7fl) and MPV (11.6fl) in the megaloblastic group showed a significantly higher value ($p <0.05$) than the hypo-proliferative group, but no statistically significant difference was seen compared to the hyper-destructive group ($p >0.05$).In the present study, platelet indices such as MPV, PCT, and PDW are higher in the hyper-destructive group and may discriminate hyper-destructive from hypo-productive causes of thrombocytopenia.

Keywords: Mean platelet volume, Platelet distribution width, Platelet large cell ratio

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INTRODUCTION

Thrombocytopenia is the presence of subnormal number of plateletsin circulating blood. It may be the result of inadequate production of platelets or their peripheral destruction. The former are known as hypoproliferative thrombocytopenias, while the latter are categorizedas destructive thrombocytopenias [1]. Since platelets are involved inprimary haemostasis, any alteration in their number is potentially life-threatening. In order to find the cause of thrombocytopenia and to differentiate between the two categories, bone marrow examination, an invasive procedure, is usually required. Although it may be debated that bone marrow aspiration can be avoided in a typical case of idiopathic thrombocytopenic purpura (ITP), most authors agree that marrow examination is essential in ITP with atypical presentation [2, 3]. Platelet volume indices, calculated from peripheral blood in automated haematology cell counters, are easily available considering the wide use of these cell counters. There are few studies in literature, which report a difference in various platelet indices in patients with thrombocytopenia, normal platelet count and thrombocytosis [4,5].

Moreover, very few studies hint that the platelet volume indices are differentially altered in various causes of thrombocytopenia (hypo proliferative versus destructive) [5, 6]. A systematic study on this aspect is important, considering the ease and non-invasive nature of platelet indices calculation vis-a` -vis bone marrow aspiration/biopsy. Platelet indices are biomarkers of platelet activation. The present study, is aimed to investigate the role of platelet volume indices in the differential diagnoses of thrombocytopenia, and an attempt to consider the use of these indices in the initial evaluation of these patients.

MATERIALS AND METHOD

For this study, 50 patients with thrombocytopenia were evaluated, who had a platelet count less than1,50,000cells/cu mm in the peripheral blood. 2 ml of EDTA blood samples were collected, and analyzed in automated blood cell counter(SysmexSF3000)to determine platelet count and indices. The study group was divided into subcategories, vis hypo proliferative and destructive thrombocytopenia, based on clinical diagnosis of the case. The clinical features, platelet counts and indices were taken into account in these thrombocytopenia categories.

RESULTS

Table 1: Age Distribution

GROUP	7–15YR	15-40YR	40-70YR	PERCENT
Megaloblastic Anemia	0	4 (8%)	3 (6%)	14%
Other hypo proliferative Group	0	5 (10%)	11 (22%)	32%
Destructive Thrombocytopenia	13 (26%)	9 (18%)	5 (10%)	54%

Patients lying in the age group of 7 to 15 years (26%), followed by 15–40 years (38%), 40-70 years (38%).

Table 2: Platelet Indices In Three Groups

Platelet indices	Megaloblastic Anemia	Other hypo proliferative Group	Destructive thrombocytopenia
MPV	Increase	Decrease	Increase
PCT	Increase	Decrease	Increase
PDW	Increase	Decrease	Increase
P-LCR	Increase	Decrease	Increase

The MPV, PDW and PLCR were significantly higher in megaloblastic group and in destructive thrombocytopenia patients, as compared to other hypoproliferative thrombocytopenia

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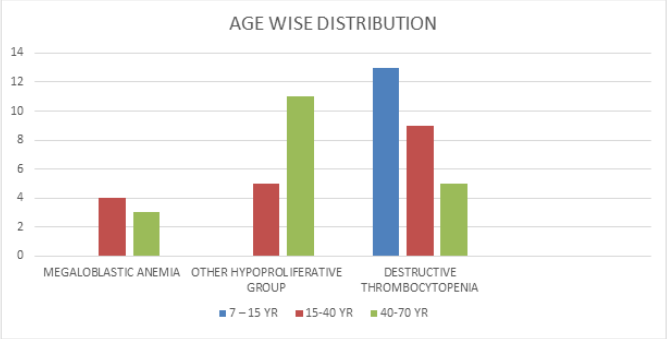
Table 3: Platelet Indices -Mean Distribution

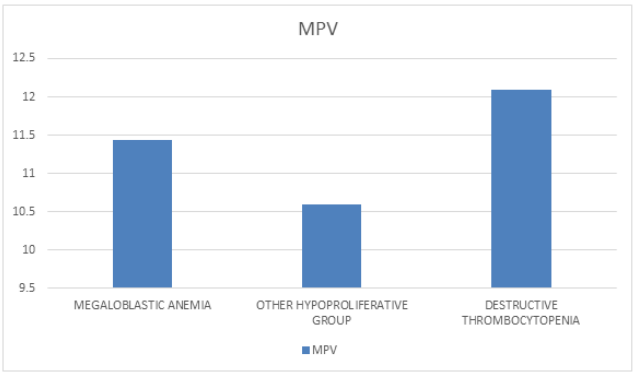
	MPV	PCT	PDW	P-LCR
Megaloblastic Anemia	11.44 fl±1.06	0.08%± 0.03 %	17.1fl±3.87	37.4%± 6.22
Other Hypo proliferative Group	10.6 fl ±1.02	0.04%± 0.03 %	11.2fl±1.89	30.5%± 6.44
Destructive Thrombocytopenia	12.1fl ±1.12	0.08%± 0.03 %	16.6 fl±3.52	41.1 %±7.77

Chart 1: Age Wise Distribution



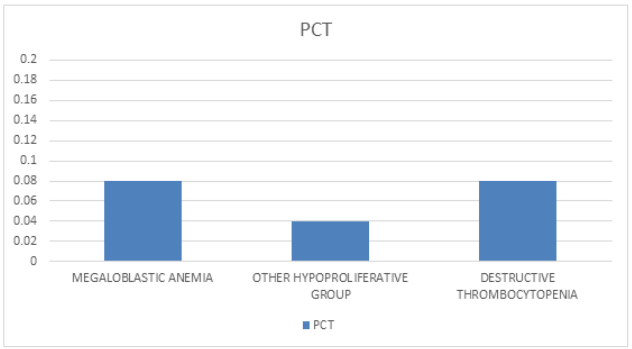
Patients lying in the age group of 7 to 15 years (26%), followed by 15–40 years (38%), 40-70 years (38%).

Chart 2: Mean Platelet Volume Distribution



MPV were significantly higher in megaloblastic group, and in destructive thrombocytopenia as compared to other hypo proliferative thrombocytopenia patients

Chart 3: Platelet Crit Distribution



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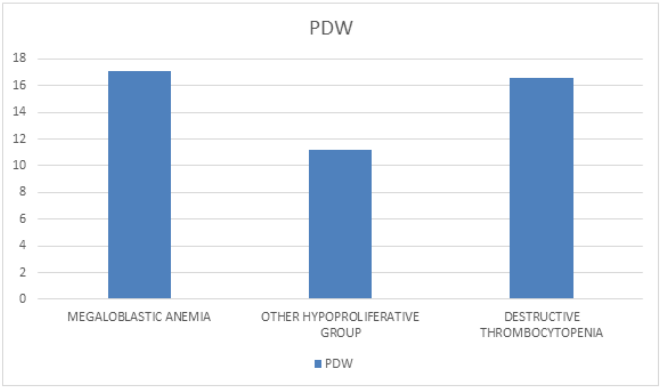
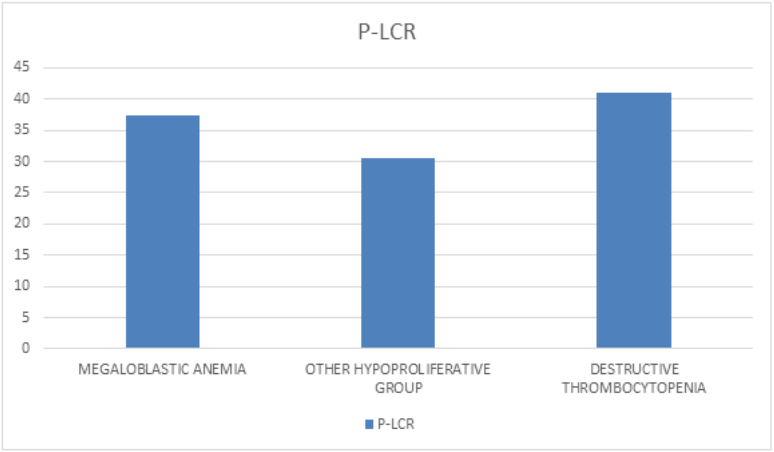
PCT were significantly higher in megaloblastic group, and in destructive thrombocytopenia as compared to other hypo proliferative thrombocytopenia patients

Chart 4: Platelet Distribution Width



PDW were significantly higher in megaloblastic group, and in destructive thrombocytopenia as compared to other hypoproliferative thrombocytopenia patients. which was significantly lower in hypoproliferative group.

Chart 5: Platelet-Large Cell Ratio Distribution



P-LCR were significantly higher in megaloblastic group, and in destructive thrombocytopenia as compared to other hypoproliferative thrombocytopenia patients.

DISCUSSION

The patients with thrombocytopenia in the age wise group ranged from 7 to 70years, with most patients lying in the age group of 7 to 15 years (26%), followed by 15–40 years (38%), 40-70 years (38%). Male to female ratio was 1.1: 1 in the thrombocytopenic patients. Platelet count and volume indices were divided into destructive thrombocytopenia and hypoproliferative thrombocytopenia. Although megaloblastic anaemia is conventionally included in hypoproliferative category, considering the ineffective haematopoiesis, our results of platelet indices in megaloblastic anaemia were strikingly different from other disease in the hypoproliferative category. Hence, we divided hypoproliferative group into megaloblastic and other hypoproliferative group for comparison. The mean values of MPV, PCT, and PDW were statistically non-significant on comparison. Statistically, the platelet count was not significantly different, between destructive and hypoproliferative categories. The MPV, PDW and PLCR were significantly higher in megaloblastic group, as compared to other hypoproliferative thrombocytopenia. Also, PDW was significantly lower in hypoproliferative group as compared to both megaloblastic as well as destructive thrombocytopenia. There was increase in MPV in destructive thrombocytopenia as compared to those with hypoproliferative thrombocytopenia. Also, it was found that the PDW and PLCR are higher in destructive

thrombocytopenia, than in hypoproliferative thrombocytopenia.

Rajashekar RB *et al*.found in their study, that the mean of platelet indices, was significantly higher ($p < 0.05$) in the hyper-destructive group [PDW (16.6fl), MPV (12.1fl), P-LCR (42.3%)] as compared to the hypo-proliferative group [PDW (11.8fl), MPV (10.9fl), P-LCR(31.5%)] and the mean values of PDW (14.7fl) and MPV (11.6fl) in the megaloblastic group showed a significantly higher value ($p <0.05$) than the hypo-proliferative group, but no statistically significant difference was seen compared to the hyper-destructive group ($p >0.05$) [7-16].

CONCLUSION

Platelet indices such as MPV, PCT, and PDW are significantly higher in hyper-destructive causes of thrombocytopenia, and may discriminate hyper-destructive from hypo-proliferative causes of thrombocytopenia. In the majority of patients, it may help in avoiding unnecessary, invasive bone marrow examination. MPV stands as a better parameter, which is statistically significant and can be used to segregate the hyper-destructive and hypo-proliferative causes of thrombocytopenia. Thus, in all cases of thrombocytopenia, the clinicians need to look in to platelet indices which are akin to RBC indices, and can help in arriving at a probable pathophysiology of thrombocytopenia, with subsequent better management.

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