Utility of Platelet Indices (Pi) In Thrombocytopenia - An Institutional Based Two Years Clincopathological Study

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Abstract
INTRODUCTION: Automated hematology analyzers that determine the Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), Plateletcrit (PCT), Platelet Large Cell Ratio (P-LCR) which could be very helpful to facilitate the differential diagnosis of thrombocytopenia and to monitor thrombocytopenic conditions.
AIMS AND OBJECTIVES: Deriving the cause of the thrombocytopenia by clinical and also by measuring the platelet indices.
MATERIALS AND METHODS: Prospective observational study of 3,864 thrombocytopenic samples of hemogram analysis by automated haematology analyzers and Static analysis was done.
RESULTS: Among the 3,864 cases of thrombocytopenia who were classified into hypo productive (874 cases) and hyper destructive (2,990) group. Most common cause of hypoproductive and hyperdestructive was Megaloblastic anaemia(10.9%) and Dengue(30.2%) respectively.
CONCLUSION: Platelet Indices were easy to measure and give a clue to aetiology of thrombocytopenia and it is also very cost effective.
Key Words: *Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), Plateletcrit (PCT), Platelet large cell ratio (P-LCR).*

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I. Introduction

Thrombocytopenia is a common clinical syndrome defined as platelet count below 1.5 lakh per microlitre of blood. During evaluation of thrombocytopenia, it is essential to identify the aetiology, whether it is due to hypo production or hyper destruction which will have major impact on the management.[1, 2, 3] Measuring various Platelet indices, such as Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), Plateletcrit (PCT) and Platelet large cell ratio (P-LCR) along with a simple Complete blood count may provide some valuable information regarding the underlying mechanism and pathogenesis of thrombocytopenia.[4, 5] MPV measures the average size of platelets. PDW is a measure of variation platelet size. It is a coefficient of variation (CV) percentage. PCT is a measure of total platelet mass. P-LCR is the ratio of large platelets.

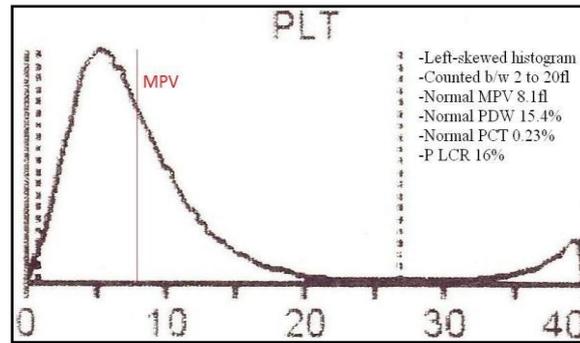| **Table 1** Normal reference ranges of Platelet Indices (PI)	
MPV	9.4–12.3 fl
PDW	10.0%-17.9%
PCT	0.22–0.24%
P-LCR	15-30%

Figure1 Normal platelet histogram

II. Materials And Methods

Total of 35,958 samples were received for hemogram analysis in two years duration and analyzed on Auto haematology analyzer. Among 35,958 samples 3,864 cases were presented with thrombocytopenia and Plateletcrit (PCT), Platelet Distribution Width (PDW) and Mean Platelet Volume (MPV) and relevant clinical details of these thrombocytopenic patients were collected and Static analysis was done.

III. Results

Among the 3,864 cases of thrombocytopenia who were classified into hypo productive (874 cases) and hyper destructive (2,990) group. Male to female ratio in hypo production and hyper destruction group was 1:1.2 and 1:1.1 respectively. Most common age group in hypo production and hyper destruction group was 50-60years and 20-30years respectively. The mean platelet count in the hypo production group is 67.4 ± 29.5 and in the hyper destruction group is 69.5 ± 28.4.
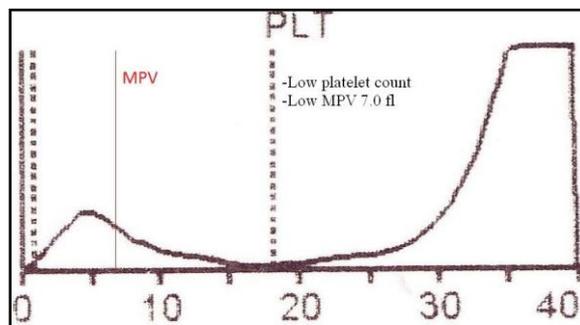

Figure2 Hypo production histogram
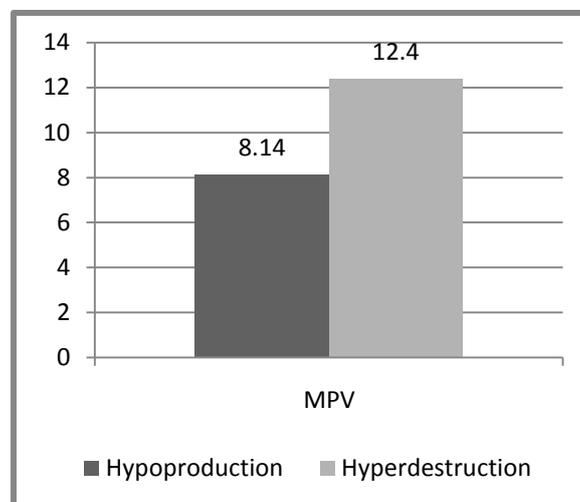

Chart1 Mean MPV in hypoproduction and hyperdestruction
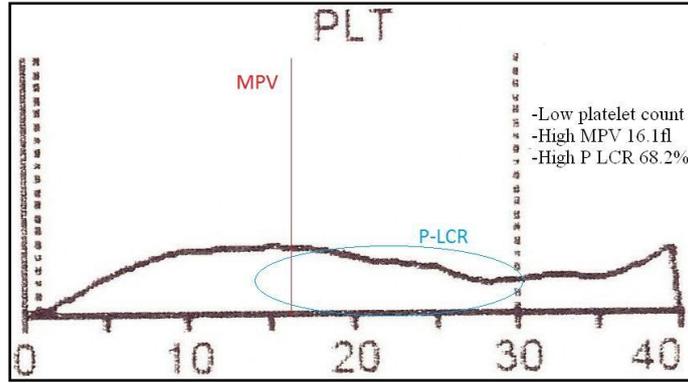
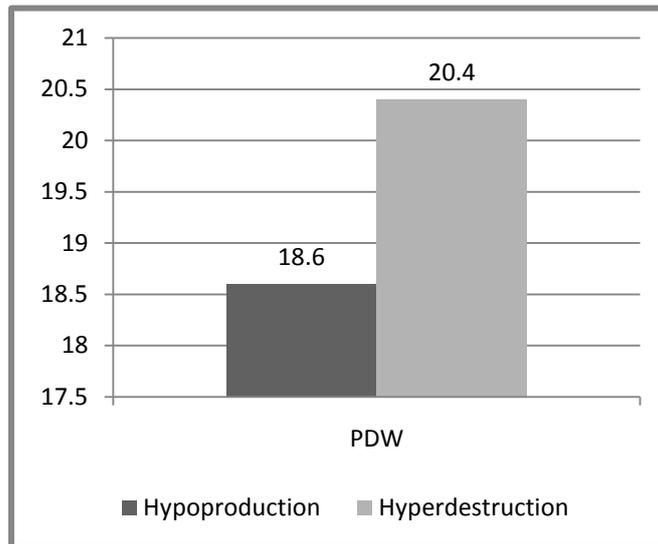---

Figure3 Hyper destructive histogram

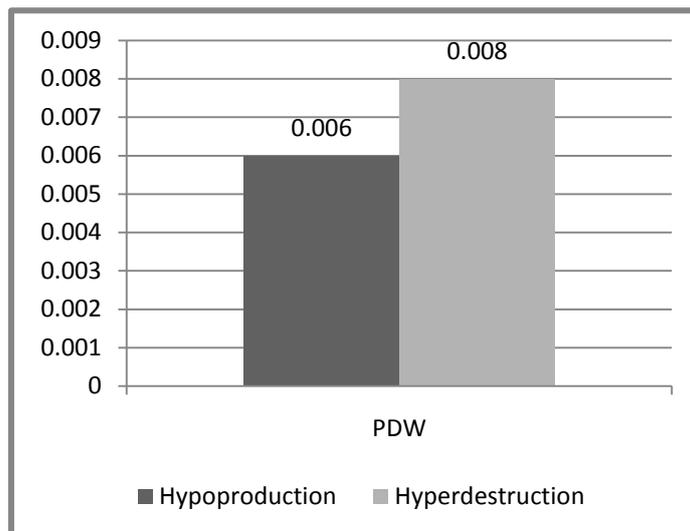**Chart2** Mean PDW in hypoproduction and hyperdestruction

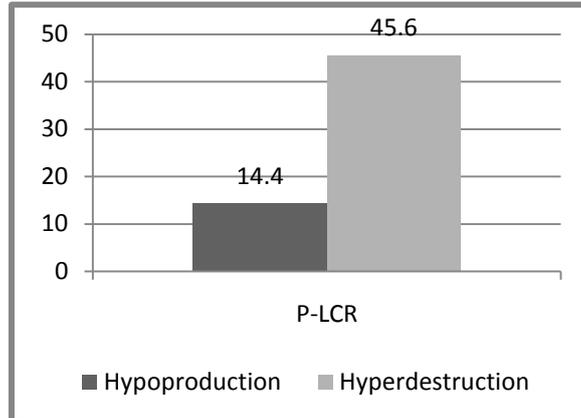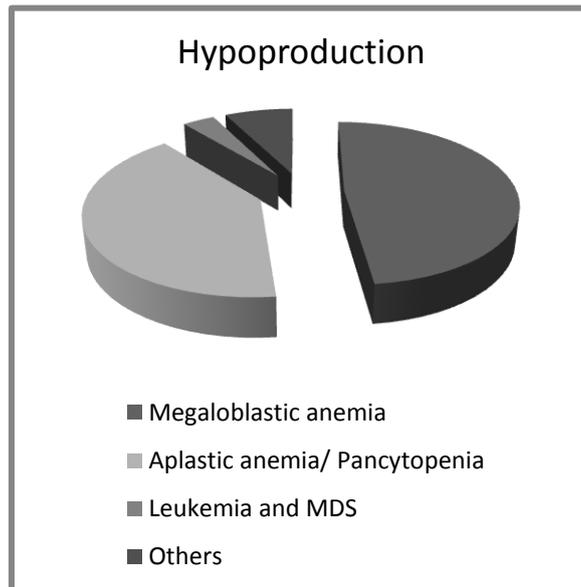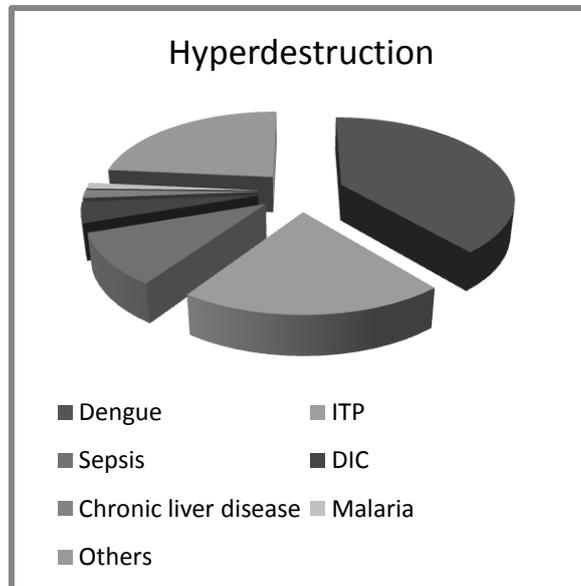**Chart3** Mean PDW in hypoproduction and hyperdestruction

Chart4 Mean P-LCR in hypoproduction and hyperdestruction

Pie chart1 Aetiological distribution of hypoproduction

Pie chart2 Aetiological distribution of hyperdestruction

IV. Discussion

Automated hematology analyzers determine MPV, PDW, PCT and P - LCR which has been correlated with several disease states.[5, 6]

Table2 Distribution and comparison of Platelet indices in thrombocytopenia with similar studies				
Platelet indices	Negash et al.[12]	Baig MA et al[13]	Parveen et al[14]	Present study
Hypo production				
MPV	9.7 ± 0.9	8.5 ± 1.27	10.17 ± 1.3	8.14 ± 1.2
PDW	13.2 ± 2.3	14.10 ± 1.15	19.7 ± 5.4	18.6 ± 1.2
PCT	-	0.08 ± 0.12	0.06 ± 0.03	0.06 ± 0.01
P - LCR	25 ± 7	31.90 ± 3.46	-	14.4 ± 1.1
Hyper destruction				
MPV	12.4 ± 3.6	11.6 ± 2.25	12.3 ± 0.9	12.4 ± 0.9
PDW	15.5 ± 3.2	15.16 ± 1.36	19.3 ± 4.2	20.4 ± 5.6
PCT	-	0.09 ± 0.14	0.08 ± 0.1	0.08 ± 0.01
P - LCR	36.8 ± 13	34.30 ± 0.14	-	45.6 ± 13.4

Table3 Aetiological distribution of thrombocytopenia in each subgroup and comparison with similar studies				
Aetiologies	Katti et al [16]	Numbenjapon et al[17]	Parveen et al[13]	Present study
Hypo production Total cases (%)				
Aplastic anemia / Pancytopenia	-	12 (11.8%)	-	356 (9.2%)
Megaloblastic anemia	08 (8%)	4 (3.9%)	11 (9.2%)	422 (10.9%)
Leukemia and MDS	06 (6%)	22 (21.6%)	2 (1.7%)	31 (0.8%)
Others	-	-	13 (10.8%)	65 (1.7%)
Hyper destruction Total cases (%)				
ITP	4 (4%)	53 (52%)	3 (2.5%)	614 (15.9%)
Viral fevers / Dengue	29 (29%)	-	26 (21.7%)	1167 (30.2%)
Malaria	24 (24%)	-	8 (6.7%)	35 (0.9%)
Chronic liver disease	3 (3%)	-	20 (16.7%)	46 (1.2%)
Sepsis	4 (4%)	9 (8.8%)	6 (5%)	301 (7.9%)
DIC	2 (2%)	-	-	124 (3.2%)
Others	19 (19%)	2 (2%)	31 (25.8%)	703 (18.2%)
Total	100	102	120	3864

MPV has an inverse relationship with platelet number volumes in thrombocytopenic patients due to peripheral destruction (Hyper destruction group) as in hyperdestruction like ITP, dengue, sepsis and myeloproliferative disorders etc.[6, 7, 8] Decreased MPV has been associated with megakaryocytic hypoplasia/ hypo production.[9] High PDW has been associated with hyper destructive thrombocytopenia because of the release of heterogenous population of platelets which vary in their size (anisocytosis).[10,11]

PCT value is not altered much by severity of thrombocytopenia of either hypo productive or hyper destructive aetiology because in healthy subjects platelet mass is closely regulated to keep it constant.[15]

P-LCR was increased in destructive thrombocytopenia patients compared with hypoproliferative thrombocytopenia and a good marker for aid in the differential diagnosis of conditions associated with abnormal platelet counts. [18]

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