ORIGINAL ARTICLE

ROLE OF PLATELET PARAMETERS IN DIAGNOSING VARIOUS CLINICAL CONDITIONS

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ABSTRACT

Background: With improvement in the technologies, advancement occurs in all field including medicine. Automated cell counters are widely used for diagnosis of different diseases. Hematocrits are important parameters that are used in routine practices. Now a day for analysing platelet abnormalities, plateletcrits are utilized. Among them Platelet counts, mean platelet volume (MPV) and platelet distribution width (PDW) are important parameters.

Aims and objective: To study platelet parameters in various clinical conditions.

Materials and Methods: A cross sectional observational study was carried out at one of the rural teaching hospitals of Gujarat. Laboratory Data from 800 patients were analysed using Microsoft excel.

Result: Total 800 patients were enrolled in the study. Among them 384 (48%) were females and 416 (52%) were males. Maximum (47%) patients were of 15- 49 yrs age group. 228 (28.5 %) patients were having infectious diseases. Whereas 248 (31%) of patients have attended clinics with chronic diseases. Patients having illnesses related to haematological causes were 144 (18.0%). Significant increase in Platelet Distribution Width & Mean platelet volume was observed among Pregnant women. Thrombocytosis was found in cases of anemia. Significantly lower platelet count were observed in Acute Myeloid leukemia (AML) and Immunothrombocytopenic pupura (ITP). Patients with ITP were having high Mean platelet count and Platelet distribution width. Inverse relationship was observed between MPV and Platelet count in cases of Anaemia. Linear relationship was observed between MPV and Platelet count among patients of ITP.

Conclusion: Platelet parameters vary in different clinical conditions and they should be used routinely to aid in diagnosis.

Key-words: Platelet count, Mean Platelet Volume, Platelet Distribution Width, Clinical conditions

INTRODUCTION

The quantification of blood cell (red blood cells, white blood cells, and platelets) is well-recognized tool used widely in the field of medicine. With availability of automated blood cell analyzers new indices related to platelet count are also being estimated. Most important parameters among them are plateletcrit (PCT), mean platelet volume (MPV) and platelet distribution width (PDW).[1] Platelet activation leads to changes in platelet shape with increase in platelet swelling leading to an increase in MPV and PDW.[2] Mean platelet volume (MPV) is comparable to the mean corpuscular volume (MCV) of red blood cells. Determinations of platelet size are traditionally made by microscopic measurements of platelet diameters, a method which is not readily available in routine daily practice. The automated cell counter, however, provides an MPV on each whole blood sample that is processed, which makes possible the study of platelet size in a great variety of clinical conditions. The combined interpretation of PLT, MPV and PDW appears highly useful in the differential diagnosis of thrombocytosis.[3] Different studies have been carried out on platelet indices and platelet disorders.[4, 5] Present study was designed to find out variation in platelet parameter in different clinical conditions.

MATERIALS AND METHODS

A cross sectional study was carried out in Year 2012 at one of the teaching institute of Gujarat, India. Ethical clearance was sought from the organizational ethical committee. Study was observational and record based. Total 800 cases were selected randomly. Information regarding age, sex, clinical diagnosis and laboratory parameters like hematocrit values and platelet parameters were recorded form each case. Data were entered in Microsoft Excel. Proportion, Mean and standard deviation were calculated. ANOVA test was

applied as a test of significance. P value <0.05 was considered as a significant.

RESULTS

Laboratory record of total 800 patients who attended the institute was studied. Among them 384(48%) were females and 416 (52%) were males. Maximum (47%) patients were of 15- 49 yrs age group. (Table 1)

Table 1: Age and Gender wise distribution of study population

Age Group	Gender		Total (%)
	Female	Male	
<5 yr	30	62	92 (11.5)
5-14 yrs	26	38	64 (8.0)
15-49 yrs	196	180	376 (47.0)
50-64 yrs	64	72	136 (17.0)
>65 yrs	68	64	132 (16.5)
Total	384(48%)	416(52%)	800

Patients were categorised in five main category viz. Carcinoma, Hematological condition (Acute lymphoid leukemia, Acute Myeloid Leukemia, Anema, Idiopathic thrombocytopenic purpura, Bleeding disorders etc.), Infectious disease, Chronic diseases (Diabetes, Hypertention, Ischemic heart diseases etc.) and pregnancy. Out of total 800 patients 228(28.5 %) patients were having infectious diseases. Whereas 248 (31%) of patients have attended clinics with chronic diseases. Patients having illnesses related to haematological causes were 144 (18.0%). (Table 2)

Table 2: Clinical diagnosis of the study subjects (n=800)

Clinical conditions	Frequency (%)
Carcinoma	92 (11.50)
Haematological Conditions	
Acute Lymphoid Leukemia	23 (2.9)
Acute Myeloid Leukemia	17 (2.1)
Anaemia	89 (11.1)
Bleeding disorders	9 (1.1)
ITP	6 (0.8)
Infectious conditions	228 (28.5)
Chronic Diseases	
Hypertension	89 (11.13)
Diabetes	78 (9.75)
Ischemic Heart Diseases	63 (7.88)
COPD	18 (2.25)
Pregnancy	88 (11.0)

Mean value of various platelet parameters viz. Platelet count, Mena platelet volume, Platelet Distribution Width were analysed for all clinical conditions. Pregnant women were having significantly lower platelet count (117.4±97) where as increase in Platelet Distribution Width (15.6±2.0) was observed among them. MPV was also shown to increase in pregnant women. Diabetics were having MPV of 8.8±1.9. In patients of Ischemic heart diseases high Mean Platelet Volume (11.1±1.5) was found. (Table 3)

Table 3: Platelet parameters in various clinical conditions

Clinical Diagnosis	Platelet Count ($x10^9/L$)	MPV (fl)	PDW (%)
Carcinoma	267.3±84.8	9.1±0.8	11.2±1.8
Infectious conditions	258.1±153.2	9.6±1.1	11.7±2.9
Hypertension	227±95.1	9.9±1.3	11.4±1.6
Diabetes	243.4±63.3	8.8±1.9	11.9±1.07
Ischemic Heart Diseases	265±78.8	11.1±1.5	12.3±1.9
COPD	233±59.3	9.8±1.05	11.9±1.5
Pregnancy	117.4±97	9.9±0.7	15.6±2.0

Values are in Mean±sd

Table 4: Platelet parameters in haematological conditions (n=144)

Clinical Diagnosis	Platelet Count ($x10^9/L$)	MPV (fl)	PDW (%)
Acute Lymphoid Leukemia (23)	212.4± 7.6	7.5±0.15	8.1±0.12
Acute Myeloid Leukemia(17)	42.8± 34.4	8.9±0.4	12.1±2.1
Anaemia(89)	368.6±143.3	9.3±0.5	11.1±1.8
Bleeding disorders(09)	108.4±119.9	9.9±0.9	11.9±0.8
ITP (06)	27.4± 1.3	10.4± 2.03	18.1±1.9

Values are in Mean±sd; ANOVA test for Platelet count, MPV & PDW; P<0.001

As haematological conditions are most likely to influence the blood chemistry, analysis was done to find out all three platelet parameters in different haematological conditions. It was observed that platelet count was higher in case of anemia as compared to other haematological conditions. Significantly lower platelet counts were observed in Acute Myeloid leukemia (AML) and Immunothrombocytopenic pupura (ITP). Patients with ITP were having high Mean platelet count and Platelet distribution width. (Table 4)

Correlation between MPV and Platelet count was done for various conditions. Inverse relationship was observed between MPV and Platelet count in cases of

Anaemia (Figure 1) whereas linear relationship was observed between MPV and Platelet count among patients of ITP. (Figure 2)

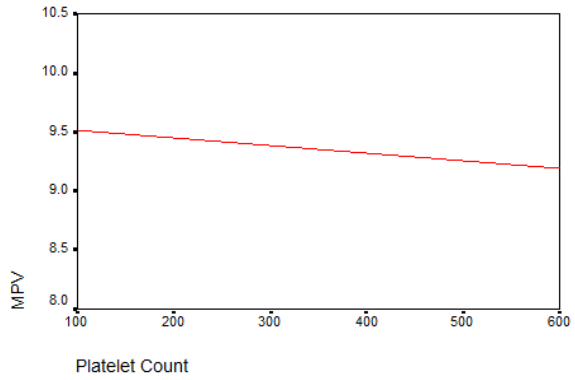

Figure 1: Relationship between Mean platelet volume and Platelet Count in Anemia cases

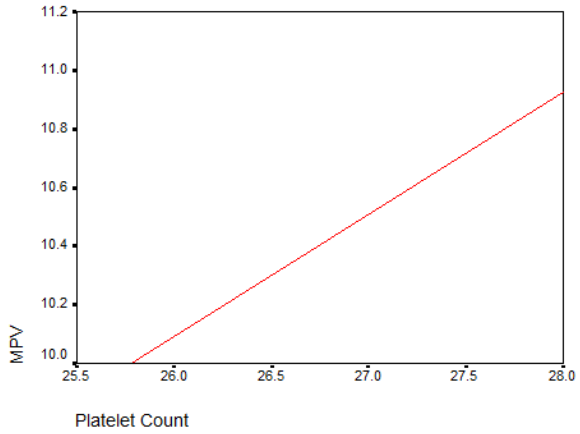

Figure 2: Relationship between Mean platelet volume and Platelet Count in Immune thrombocytopenic Purpura (ITP)

DISCUSSION

Blood platelets are highly complex, anucleate cells. They are the derivative of bone marrow megakaryocytes. Routinely a well-prepared peripheral blood film is used for evaluation of platelet number, size, distribution, and structure under the light microscope. One of the drawbacks of microscopic method is possibility of artefact that may lead to misdiagnosis. With availability of Automated cell counters more precise information can be gathered. They give almost similar result to that of microscopy. Their use has been largely increase in developed as well as developing countries. Present study was carried out with objective of studying platelet paremeters in various clinical conditions. Record of total 800 patients was analysed. Among them 384(48%) were females and 416 (52%) were males. Maximum (47%) patients were of 15- 49 yrs age group. Patients were categorised in five main category viz. Carcinoma, Hematological condition (Acute lymphoid leukemia, Acute Myeloid Leukemia, Anemia, Idiopathic thrombocytopenic purpura, Bleeding disorders etc.), Infectious disease, Chronic diseases (Diabetes, Hypertention, Ischemic heart diseases etc.) and pregnancy. Almost equal proportions of cases were seen for infectious (28.5 %) as well as chronic conditions (31 %). In present study reduction in the platelet count and increase in PDW & MPV was observed among pregnant women. Similar finding was there in the study carried out by Fay et al who stated that during pregnancy an increase in platelet aggregation and a decrease in the number of circulating platelets occur with gestation.[6] Ahmed et al also mentioned that Platelet lifespan declines and the MPV increases minimally during pregnancy.[7] Increased utilization of platelets has been suggested to be the reason of the reduction in the number of circulating platelets.

In patients with COPD relatively high MPV was noticed. This may be because of platelet activation which occurs as a result of chronic hypoxia. Similar result was there in study carried out by Steiropoulos et al.[8] They mentioned that in smokers with COPD, MPV was significantly higher. In our study higher values of MPV & PDW were noticed in cases of IHD. Study carried out by Khakendar et al [9] demonstrated the same results.

In our study thrombocytosis was noticed among anaemic patients. There was inverse relationship between MPV and Platelet count among them. Several studies reported similar inverse relationship between mean platelet volume and platelet counts in patients with IDA. [10-12] In present study lower platelet count were observed in Acute Myeloid leukemia (AML) and Immunothrombocytopenic pupura(ITP). In AML, deficient platelet production in the bone marrow causes thrombocytopenia whereas in ITP immune mediated destruction of platelet occurs in the peripheral blood. Raised MPV and PDW in both cases reflect increase in the production rate. MPV as well as PDW were higher in ITP than AML in our study. Linear relationship was observed between MPV and Platelet count among patients of ITP.

CONCLUSION

Apart from Platelet count, other platelet parameters like MPV & PDW differ in various clinical conditions. Among patients with Ischemic heart diseases and hypertension raised MPV was found whereas patients with diabetes were found to have relatively lower MPV. Similarly in hematological conditions like ITP & Acute myeloid leukemia, lower platelet count was found in both conditions, but values of MPV was higher in cases of ITP while they were lower in cases of AML. Findings of present study suggest that MPV and PDW are simple platelet indices, which increase during platelet activation and they can aids in diagnosis where platelet counts remain unaltered and also they can be taken as a risk

factor for conditions like IHD. Wherever facilities are available they should be used as routine investigatory measures.

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