ORIGINAL RESEARCH PAPER

Volume-7 | Issue-8 | August-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

RELATION OF PLATELET PARAMETERS IN CASES WITH LEUKOPENIA AND LEUKOCYTOSIS PATIENTS.

Pathology

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ABSTRACT

Apart from playing an important role in the primary haemostasis platelets also have different roles in inflammation, atherosclerosis, angiogenesis and antimicrobial host defence. Variation in their size indicates change in their function. Platelet parameters are thought to vary in inflammatory conditions and infections. This study was conducted with the aim to investigate the relationship between PLT count and its parameters, including MPV, PDW and PCT in patients having leukocytosis and leukopenia. Total 462 subjects were studied with 231 cases and controls each. Cases were further subdivided into 51 cases having leukopenia and 180 cases having leucokytosis. The platelet parameters were studied in both leucocytosis and leukopenia cases and compared with controls. P value was calculated. The platelet count, plateletcrit are decreased and MPV is increased in Leukopenia patients. However in patients of leukocytosis, MPV may not provide additional information as MPV is variable parameter and should be interpreted along with other inflammatory parameters.

KEYWORDS

Platelet Parameters, Leucokytosis, Leukopenia

INTRODUCTION

Platelets (PLTs) play an important role in the primary haemostasis. [1,2]. In addition to this, they have different roles in inflammation, atherosclerosis, angiogenesis, antimicrobial host defence, and contribution to wound healing [1-4]. Over the last few years, several new and reportable parameters have been used in the routine complete blood count (CBC) analyzers [5]. Automated blood cell counters provide a platelet count and derive indices relating to the size of platelets. Variation in platelet size is indicative of change in platelet function. Therefore platelet parameters are markers that are thought to be increased in response to systemic inflammation, and various studies have stated the relationship between these parameters and different inflammatory disease [6,7].

The volume of platelets in the bloodstream is heterogeneous. Mean platelet volume (MPV) is calculated by dividing the plateletcrit (PCT) by the number of platelets. MPV is a potential marker of the platelet reactivity [8]. The platelet volume is found to be associated with cytokines (thrombopoietin, interleukin-6 and interleukin-3) that regulate megakaryocyte ploidy and platelet number and result in the production of larger platelets (9, 10, 11). When platelet production is decreased, young platelets become bigger and more active, and MPV levels increase. Increased MPV indicates increased platelet diameter, which can be used as a marker of production rate and platelet activation

PDW is an indicator of volume variability in platelets size and is increased in the presence of platelet anisocytosis (11). The platelet distribution width (PDW) is the width of the size distribution curve in femtoliter (fL) at the 20% level of the peak on the impedance platelet size distribution curve [5, 6]. Under physiological conditions, there is a direct relationship between MPV and PDW (12).

PCT is the volume occupied by platelets in the blood as a percentage and calculated according to the formula PCT = platelet count × MPV / 10,000. Under physiological conditions, the amount of platelets in the blood is maintained in an equilibrium state by regeneration and elimination (13)

A substantial number of studies have demonstrated crucial roles for platelets in the pathogenesis of various inflammatory clinical conditions where inflammation is important. Numerous research groups have found a relationship between the changes in platelet indices and the activation of the coagulation system, severe infection, trauma, systemic inflammatory reaction syndrome, and thrombotic diseases (14). Platelet indices have been shown to have diagnostic value in certain inflammatory diseases, such as inflammatory bowel diseases, rheumatoid arthritis, ankylosing spondylitis, ulcerative colitis, and atherosclerosis (14, 15).

In view of this, we conducted this study with the aim to investigate the relationship between PLT count and its parameters, including MPV, PDW and PCT in patients having leucocytosis and leukopenia.

MATERIAL AND METHODS

This was an observational cross sectional study. Total 462 samples were studied. All the patients admitted in Government Medical College having total leucocyte count more than 11000/mm3 (leukocytosis) or less than 4000/mm3 (leukopenia) were included in the study and their platelet parameters were studied. Patients having complicated infections or very high counts, haematological malignancies, bone marrow transplant recipients, patients with chronic infection and Aplastic anemia were excluded from the study. The complete blood count (CBC) was done on Erma INC three part machine. Out of total 462 cases, 231 were patients and were included from 1/9/17 to 1/12/17. 231 controls having normal TLC, Haemoglobin and Platelet count were also taken. Controls were selected on the basis of normal haemoglobin, TLC and Platelet count. In the present study, normal range for the parameters were taken according to the machine range (Erma INC) and are as follows:

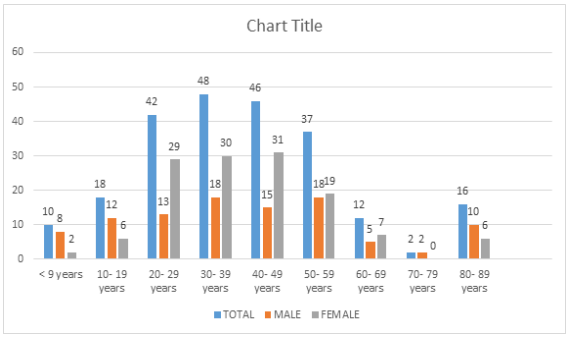
TLC: 4000 to 11000/mm3
Haemoglobin (Hb): 11g/ dl to 16g/ dl
Platelet count: 1.5 lakh to 4.5 lakh/mm3
Mean Platelet Volume (MPV): 7.4 to 10.4fl
Platelet distribution width (PDW): 10 to 17%
Platetecrit (PCT): 0.10 to 0.28%
Platelet Large cell ratio (P- LCR): 13 to 43%

OBSERVATIONS AND RESULTS

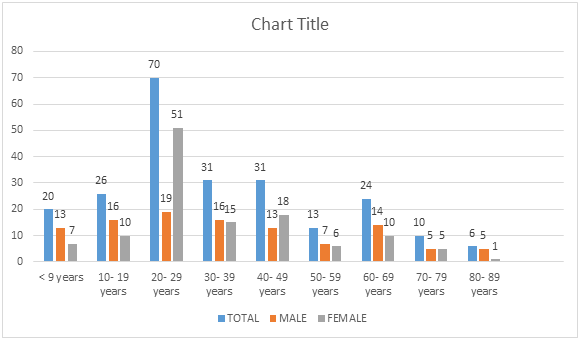
In this cross sectional observational study, total 462 subjects were studied. Out of total 462 subjects, 231 were cases and same number of cases were controls.

All the subjects were between 1 day old to 90 years of age. In cases, maximum number were in 3rd decade where as in controls, maximum cases were in 4th decade. Bar diagram 1 and 2 shows age wise distribution of cases and controls.

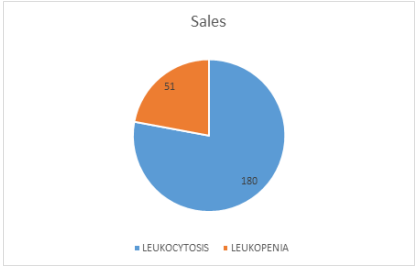
Bar diagram no 1 showing age and gender wise distribution of total 231 controls



Bar diagram no. 2 showing age and gender wise distribution of total 231 cases



231 cases were divided according to total leuckocyte count into leucocytosis cases and leukopenia cases. Pie diagram below shows distribution of cases into leucocytosis (180) and leukopenia (51).



Pie diagram showing distribution of cases according to TLC

Table 1 shows comparison of platelet parameters of leukocytosis and leukopenia categories with control group. P value was calculated using unpaired t test.

Table no 1 showing mean values of platelet parameters along with P value in various groups.

GROUP	PLT. COUNT	PTC	MPV	PDW
CONTROLS	242.9 ± 63.6	0.21± 0.06	8.8± 1	11.3± 2.1
LEUKOCYTOSIS	254.1± 187.9	0.22± 0.08	9.3± 0.8	11.0± 2.7
LEUKOPENIA	120.6±81.0	0.13± 0.09	11.0± 1.5	11.6± 4.1
P value (leukocytosis)	0.37	0.11	<0.01	0.16
P value (leukopenia)	<0.01	<0.01	<0.01	0.30

DISCUSSION

Under normal circumstances there is inverse relationship between platelet size and number (16,17). MPV has been studied as simple inflammatory marker in several diseases. MPV increases in myocardial infection, cerebrovascular disease, while in contrast it decreases in active rheumatologic diseases including Rheumatoid arthritis (RA), Ankylosing spondylitis and Ulcerative colitis (18, 19).

MPV is a marker of platelet function and activation and it is also influenced by inflammation. Gasparyan et al stated that high grade inflammation accompanies a decrease of MPV in RA and SLE possibly due to increased consumption of large platelets at the sites of rheumatoid inflammation (20). MPV was found to be low in active disease states of ankylosing spondylitis, RA and SLE and get normalised after treatment (16, 21).

In our study, platelet count and plateletcrit of leukopenia patients was decreased when compared to control group (Table no 1) and this difference was statistically significant ($p < 0.01$). Also the MPV of leukopenia patients was higher than control group and this difference was also statistically significant (table no 1). With the above findings, our study supported the inverse relationship between platelet count and platelet size. All the leukopenia patients were treated on OPD basis and had history of fever and this was probably the reason for decreased platelet count. There was no change in PDW in this group of patients. Currently there are no studies comparing platelet parameters in leukopenia cases. On the contrary, although platelet count and plateletcrit in leucocytosis group was higher than the control but this difference was not statistically significant ($p > 0.01$). However, the MPV of leukocytosis group was higher and statistically significant ($p < 0.01$) as compared to control but this finding in our study did not match the study by Nurinnisa Ozturk et al who concluded that platelet counts are increased in leukocytosis but there is no change in MPV (22). There was again no change in PDW in this group of patients.

CONCLUSION

The platelet count, plateletcrit are decreased and MPV is increased in Leukopenia patients. However in patients of leukocytosis, MPV may not provide additional information as MPV is variable parameter and should be interpreted along with other inflammatory parameters.

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