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EVALUATION OF PLATELET INDICES IN DENGUE SEROPOSITIVE CASES AT A TERTIARY CARE HOSPITAL IN HYDERABAD.

Pathology

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ABSTRACT

Background: Dengue is caused by an arbovirus and is transmitted by mosquito Aedes aegypti. In addition to platelet count, Platelet indices like Mean platelet volume (MPV), Platelet distribution width (PDW) ,Plateletcrit (PCT) and Platelet large cell ratio (P-LCR) are being investigated as prospective platelet activation indicators.

Aims And Objectives: To evaluate the role of platelet indices in dengue seropositive cases.

Materials And Methods: This study was a retrospective one conducted on dengue seropositive cases in Department of pathology, Deccan College of medical sciences, Hyderabad. Cases were collected from Dept of medicine and pediatrics over a period of 2 months in Oct-Nov 2021. Blood samples were processed on Sysmex XN 550 automated cell counter and platelet counts were cross checked manually.

Results: In this study, Out of 350 samples received, 1OO patients were found to be positive for dengue serology. Male: Female ratio was 1.3:1 with average age being 7.5years .60 % cases had platelet counts below 50,000/cumm. Among platelet indices, 72 % of the patients had mean platelet volume (MPV) less than 8.5fl; 84 % cases had Plateletcrit less than 0.22 %; 80 % had platelet distribution width (PDW) more than 25 fl and P-LCR was increased in 56% cases.

Conclusion: We observed significant correlation of low platelet count with MPV, PCT, PDW and P-LCR. MPV is a marker of platelet function and activation, high MPV indicates increased megakaryocytic activity whereas low MPV indicates marrow suppression. PDW is an indicator of platelet anisocytosis and has a negative correlation with low platelet count. P-LCR is inversely related to platelet count and directly related to PDW. It is decreased in patients with thrombocytosis and increased in thrombocytopenia.

KEYWORDS

Platelet indices, MPV, PDW, Plateletcrit, PLCR.

INTRODUCTION:

Dengue is caused by an arbovirus (arthropod-borne viruses) that belongs to the genus flavivirus of the family flaviviridae and has one of the four serotypes of the dengue virus (DEN-1, DEN-2, DEN-3, and DEN-4). It is transmitted by mosquito Aedes aegypti.[1,2] It produces two types of diseases- one mild self limiting illness that is dengue fever and the other is dengue hemorrhagic fever/ dengue shock syndrome which is fatal [3] Increase in the incidence of dengue outbreaks are seen during the monsoon and post-monsoon seasons. Children and young adults are the population that are most affected.

Diagnosis is done by detection of dengue specific antibodies (IgM/IgG) and by NS1 antigen. Antibody detection is an indirect method of diagnosis and is prone to false results. NS1Ag detection is both sensitive and specific.

One of the most common laboratory findings in dengue is thrombocytopenia [2]. The complex mechanism of thrombocytopenia remains unclear. Possible mechanisms of thrombocytopenia could be, direct bone marrow suppression by the virus; antidengue antibody-mediated platelet destruction, peripheral consumption of platelets and isolated viral replication in the platelets.

Thrombocytopenia is found to predict the severity of the disease and leads to bleeding although the platelet count may not directly correlate with the bleeding manifestations. [4,5]

Platelet indices like Mean platelet volume (MPV), Platelet distribution width (PDW), Plateletcrit (PCT) and Platelet large cell ratio (P-LCR) are being investigated as prospective platelet activation indicators.[5,6] (Table 1)

Table 1: Platelet Indices

Platelet indices	Definition	Normal range
Mean platelet volume(MPV)	Measure of platelet volume expressed in femto litres	8.6-15.5 fl
Platelet distribution width(PDW)	Measure of variability of platelet size	8.3- 25 fl
Plateletcrit (PCT)	Volume of platelets expressed as a % of total blood volume	0.22-0.24 %
Platelet large cell ratio(P-LCR)	% of circulating larger platelets(>12fl)	15-35 %

MATERIAL AND METHODS:

This was a retrospective study done for a period of two months from October -November 2021, in the Department of Pathology, Deccan college of Medical Sciences, Hyderabad. In the present study, we have tried to correlate the role of platelet indices with serological positive dengue cases. A total of 350 serum samples were collected from clinically suspected cases of dengue like illness from department of Medicine and Pediatrics and screened for dengue serology. All the seropositive cases were processed for platelet counts and platelet indices using SYSMEX XN 550 automated cell counter and all the abnormal platelets were cross checked manually. The informed consent was obtained from each patient prior to commencement of this study.

RESULTS:

Of the 350 serum samples tested, a total of 100 samples were found to be seropositive for dengue parameters. The numbers of males affected were 56 and females were 44 with Male: Female ratio of 1.3:1. The most effected age group was 0-10 years which contributed to 40 % of the cases followed by the 11-20 yrs age group accounting for 28% of the cases. The youngest patient was of 3 months and the eldest one to be effected was of 74 years of age. (Table 2)

Table 2: Age Wise Distribution Of Dengue Positive Cases

Age group(yrs)	0-10	11-20	21-30	31-40	41-50	51-60	>70
No. of cases (%)	40	28	16	04	08	00	04

Of 100 positive cases, 12% cases had adequate platelet counts whereas thrombocytopenia was seen in 88% cases of which 60% cases had platelet counts below 50,000/cumm, 16 % cases had platelet count between 50k to 1 lakh and 12 %cases had a platelet count between 1-1.5 lakhs/cumm (Table 3).

Table 3: Platelet Distribution In Dengue Positive Cases

Platelets/cumm	< 50,000	50,000-1 lakh	1-1.5 lakh	>1.5 lakh
No. of cases (%)	60	16	12	12

DISCUSSION:

Of the 350 serum samples tested, a total of 100 samples were found to be seropositive for dengue parameters. The numbers of males affected were 56 and females were 44 with male: female ratio of 1.3:1. Our study analysis was found to be similar to the one done by Anagha A et al [7], Ingale et al [8] and by Mohan et al [9] which was found to be 1.2:1.

Of all the seropositive cases, the most effected age group was of pediatric age group (0-10 years) which contributed to 40 % of the cases with average age being 7.5years.This study was contrary to other studies where adult population were affected more than the pediatric age group. This was followed by the 11-20 year age group with 28% of cases which were compatible with the studies done by pandey et al [10] .The youngest patient was of 3 months and the eldest one to be effected was of 74 years of age.

Thrombocytopenia in dengue is caused by bone marrow suppression & immune mediated clearance of platelets [11]. It aids in diagnosis of dengue & helps in its differential diagnosis [12] .It is useful as a diagnostic, predictive & recovery parameters of DHF [5]. We had 88% cases of thrombocytopenia, with 60% of cases having platelet counts below 50,000/cumm, 16 % having counts between 50,000 to 1 lakh/cumm and 12 % of patients with platelets ranging from 1-1.5 lakhs/cumm. Studies done by Chiranth S et al [13] and Shailja et al[14] too showed significant cases of thrombocytopenia.

Platelet indices such as platelet count, mean platelet volume (MPV), Plateletcrit (PCT) platelet distribution width (PDW), and platelet large cell ratio(P-LCR) are simple indices which helps in discriminating causes of thrombocytopenia as hypo productive or hyper destructive.

Table 4: Comparision Of Platelet Indices

Parameter	Normal (%)	Decreased (%)	Increased (%)
Platelet count	12	88	-
MPV	16	68	16
PDW	12	08	80
PCT	16	84	-
P-LCR	36	08	56

Mean platelet volume (MPV) is a marker of platelet function and activation. Out of 100 patients in our study, 68 % cases had MPV less than 8.5fl. This was similar to study conducted by Navya, et al [15] and Bashir et al [16] .They also observed predominance of low value of mean platelet volume (MPV) with low platelet count. Navya, et al [15] in their study group of 100 patients, MPV of <9 fl was observed in 72% of cases. A mean MPV of < 9fl indicates bone marrow suppression thus postulating transient bone marrow suppression by dengue virus as one of the mechanisms of thrombocytopenia in patients of dengue fever [15] .Thus we can conclude that low MPV is associated with low platelet count and may be used as a probable indicator for dengue in endemic areas as also suggested by Bashir et al [16] .However studies conducted by Manoharan A et al[17] and Afsar N et al[18] observed high MPV with low platelets which was contrary to our study. According to their study, Increased platelet volume increases platelet adhesion, aggregation and synthesis of thromboxanes which can lead to complications like disseminated intravascular coagulation [17, 18] . Therefore we conclude that high MPV indicates increased megakaryocytic activity which leads to complications like DIC whereas low MPV indicates marrow suppression with increased risk of bleeding. When marrow suppression is the cause of thrombocytopenia, a rising trend in MPV heralds platelet recovery [19] Thus MPV is surrogate marker of bone marrow activity. Correlation of platelet count and MPV with bleeding and severity of the disease can potentially help in predicting outcome of the disease.

Plateletcrit (PCT) is the volume of platelets expressed as a percentage of total blood volume.PCT parallels the platelet count. In our study, 84 % cases had Plateletcrit less than 0.22 %; 16 % patients had Plateletcrit between 0.22 and 0.24 % and none of the patients had plateletcrit more than 0.24%. This was similar to study done by shailaja et al. with 91.5% of patients having lowered plateletcrit values.[14]

Platelet distribution width (PDW) directly measures variability in platelet size, changes with platelet activation, and reflects the heterogeneity in platelet morphology. It is an indicator of platelet anisocytosis. PDW is increased in the presence of platelet anisocytosis. PDW and P-LCR are analyzed from a histogram of platelet size distribution. The distribution width at the level of 20% (the peak of the histogram is 100%) is defined as PDW, and the percentage of platelets with a size of more than 12fL was defined as P-LCR. In the present study, when PDW was correlated with platelet count at presentation, a negative correlation between the mean PDW and the platelet count was found. 80 % had platelet distribution width (PDW) more than 25 fl; 12 patients (12%) had PDW between 8.5 and 25 fl and 8 cases had PDW less than 8.5fl. This was similar to study done by Nehara et al and Navya et al that had raised PDW values of 78 % and 92% respectively[15,20].

Platelet larger cell ratio (P-LCR) is an indicator of circulating larger platelets (>12 fL). It has also been used to monitor platelet activity. Platelet larger cell ratio (P-LCR) is inversely related to platelet count and directly related to PDW. It is decreased in patients with thrombocytosis and increased in thrombocytopenia. A greater increase in P-LCR is seen in destructive thrombocytopenia than those with hypoproliferative thrombocytopenia [21] In our study; P-LCR was normal in 36% cases, decreased in 8% cases and increased in 56% cases. Studies done by kantharaj et al and vani et al showed similar result with raised P-LCR values. [22,23]

CONCLUSION:

Platelet indices are useful markers both for early diagnosis and prognosis. Plateletcrit can help assess both quantitative as well as qualitative platelet disorders and there is a direct relation between PCT and platelet count .Lower platelet count and low PCT are seen with severe dengue, increasing platelet count and PCT suggest recovery phase of dengue. MPV is a measure of platelet production and activation. In cases of thrombocytopenia, raised MPV may be due peripheral destruction of platelets causing increased megakaryocytic activity whereas MPV may be decreased if there is bone marrow suppression.PDW is a measure of variability in size (anisocytosis) and is usually raised along with lower platelet counts and PCT in severe cases. P-LCR is used to monitor platelet activity and is inversely related to platelet count and increased levels are seen in destructive thrombocytopenia as well as hypo proliferative thrombocytopenia.

These parameters need to be studied more, as their significance if recorded, can prove to be very useful in establishing causes of thrombocytopenia and will also reduce the need for the costly and invasive procedures at least in routine cases.

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Conflicts Of Interest: There are no conflicts of interest

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