

## Role Of Platelet Indices In Patients With Dengue Fever- A Case Control Study.

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**Abstract:** Dengue is a global endemic and most prevalent human arbovirus disease. Recently, platelet indices have been assessed usefully in the diagnosis conditions with abnormal platelet counts. Present study aims to investigate and assess the role of platelet indices in patients with dengue fever in MIMS hospital. Platelet counts (PLT), mean platelet volume (MPV), platelet distribution width (PDW) were measured. This study was conducted prospectively for a period of 9 months from March 2018 to December 2018. A total of 105 cases are taken into study. MPV and PLT were significantly lower in cases of dengue ( $P < 0.0006$ ). The PDW is significantly high in cases of dengue ( $P < 0.039$ ).

Hence forth Low PLT, MPV and PDW may be used as probable indicators for dengue in endemic area.  $MPV < 9$  fl and  $PDW > 13$  fl shows considerable sensitivity for dengue fever.

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### I. Introduction

Dengue fever is the most rapidly spreading mosquito-borne viral disease in the world. They are members of the genus flavivirus. The primary vector is *Aedes aegypti* mosquito. Man and mosquito are reservoirs of infection. There are four virus serotypes, which are designated as DEN-1, DEN-2, DEN-3 and DEN-4<sup>(1)</sup>. It occurs in two forms: Dengue Fever and Dengue Haemorrhagic Fever (DHF). Dengue Haemorrhagic Fever (DHF) is a more severe form, which may cause death<sup>(2)</sup>. Hemoconcentration or evidence of plasma leakage may progress to dengue shock syndrome.

One of the most common laboratory findings in dengue is thrombocytopenia. The decreasing platelet counts (PLT) have found to predict the severity of the disease. 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 platelet<sup>(3)</sup>. Platelet count may not directly correlate with the bleeding manifestation<sup>(6)</sup>.

Recently, novel platelet indices have been investigated as prospective platelet activation markers<sup>(5)</sup>. Among these platelet indices, plateletcrit (PCT), mean platelet volume (MPV), and platelet distribution width (PDW) are a group of platelet parameters determined together in automatic CBC profiles, they are related to platelets' morphology and proliferation kinetics<sup>(10)</sup>. Typically, the average mean platelet volume is (8.0–12.0 fL). MPV is the mode of the measured platelet volume. A high MPV is suggestive of increased megakaryocyte activity<sup>(10)</sup>. A low MPV indicates bone marrow suppression. PDW is an indicator of volume variability in platelets size and is increased in the presence of platelet anisocytosis. Standard PDW ranges from (9.0-14.0 fL). PDW directly measures variability in platelet size, changes with platelet activation, and reflects the heterogeneity in platelet morphology<sup>(10)</sup>.

### II. Aims And Objectives

1. To investigate and assess the role of platelet indices like Platelet counts (PLT), mean platelet volume (MPV), platelet distribution width (PDW) in patients with dengue fever.
2. To study frequency of age wise distribution of dengue cases.
3. To correlate between severity of dengue fever and platelet indices.

### III. Materials And Methods

A case control study was conducted prospectively for a period of 9 months from March 2018 to December 2018. The platelet parameters were measured by the CelltacES Automated hematology analyser MEK-6410P/MEK6420P on venous samples collected in k3EDTA from 105 patients as a clinical sample and 100 apparent healthy normal individuals as control sample who are dengue negative.

**Study design:** Prospective study.

**Study location:** Tertiary care hospital based study conducted in Department of Pathology in Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram, Andhra Pradesh.

**Study duration:** March 2018 to December 2018.

**Sample size:** 105 cases.

**Subjects & Selection method:** The specimens were analysed within 1 hour from venesection. The parameters analysed included PLT, MPV, PDW. Observations based on the MPV were considered valid only if the specimens were analysed within 1 hour from venesection, to avoid the problems occurring when EDTA collected samples are analysed. Patients were classified as dengue fever, dengue hemorrhagic fever according to WHO guidelines<sup>(1)</sup>. Laboratory diagnosis of dengue was established by demonstration of Dengue antigen and antibody combi test (Dengue Day 1 Test) which is a rapid visual test for the detection of Dengue NS1 Ag & differential detection of IgM and IgG antibodies in Human serum/plasma.

**Inclusion criteria:**

All patients with clinical features and serologically positive dengue infection.

**IV. Results**

The total number of the confirmed dengue patients was 105. The age of the patients in this study was between 1 – 80 years. 100 individuals were selected as control group. The control group individuals are aged between 1– 80 years. Of the 105 clinical patients, (61)60% were males and (44) 40% were female. Age group most effected was first two decades with 20% in the age group of 11-20 years and 18.09% in the age group of <10 years.

All 105 patients presented are analysed for PLT, MPV, PDW. The mean MPV was 7.29, mean PDW was 14.51, mean PLT was  $95 \times 10^9/l$  in test group. Low MPV which indicates bone marrow suppression was noted in 36.19% of patients with DF and 11.42% in patients with DHF. A high PDW which indicates as useful marker for platelet activation was seen in 59.19% of patients with DF and 11.42% in DHF patients.

There is significant difference ( $p < 0.05$ ) in platelet indices between test group and control group. Mean MPV and PLT was found to be significantly lower in test group compared to control group and mean PDW was found to be significantly higher in test group. P Values for MPV, PDW, PLT in test group is (0.0003, 0.001, 0.000) which shows that there is a significant difference in test group and control group platelet indices.

**Table no 1 Platelet indices in case group of study.**

Diagnosis	Low MPV	Normal MPV	High MPV	Total
DF	38(36.19%)	55(52.38%)	0	93(88.57%)
DHF	12(11.42%)	0	0	12(11.42%)
TOTAL	50(47.61%)	55(52.38%)	0	105(100%)
Diagnosis	Low PDW	Normal PDW	High PDW	Total
DF	4(3.8%)	30(28.57%)	59(56.19%)	93(88.57%)
DHF	0	0	12(11.42%)	12(11.42%)
TOTAL	4(3.8%)	30(28.57%)	71(67.61%)	105(100%)

**Table no 2 The difference of platelet indices between case and control group of study.**

Parameters	Test group(mean)	Control group mean	P value
MPV	7.29	9.23	0.0003
PDW	14.51	12.6	0.001
PLATELET COUNT	95652	205762	0.000

**Table no 3 Age and sex wise distribution of dengue cases in case group of study.**

Age in yrs	Male	Female	Total
<10	11	8	19 (18.09%)
11-20	13	8	21 (20%)
21-30	7	6	13 (12.38%)
31-40	3	3	6 (5.71%)
41-50	5	4	9 (8.57%)
51-60	9	2	11 (10.47%)
61-70	9	8	17 (16.19%)
>71	4	5	9 (8.57%)
Total	61	44	105 (100%)

**V. Discussion**

Dengue fever is a growing public health concern in tropical countries like India. It is assessed that there are as of now 50-100 million instances of dengue consistently around the world, including more than 5,00,000 announced instances of dengue hemorrhagic fever and dengue shock syndrome (DHF/DSS)<sup>(3)</sup>. In

present study we found that MPV and Platelet count were lower in dengue fever patients when compared to controls. In contrast, PDW levels were higher in dengue fever patients compared to controls. MPV level was significantly lower and PDW level was significantly higher in the dengue fever, which reflect that decreasing MPV and increasing PDW levels may predict dengue fever. Serially observing the MPV and platelets may guide a clinician in an important subset of patients in DF and severe dengue where the mechanism of thrombocytopenia is largely marrow suppression<sup>(4)</sup>.

MPV has been evaluated as a diagnostic tool in different conditions with thrombocytopenia with contradictory results. It has been demonstrated that MPV has sufficient sensitivity and specificity to discriminate aplastic anemia, bone marrow disease, hypoproliferative thrombocytopenia, and bone marrow metastasis of solid tumour<sup>(7-9)</sup>. Increased MPV indicates increased platelet diameter, which can be used as a marker of production rate. During activation, platelets shapes change from biconcave discs to spherical, that leads to MPV increase during platelet activation<sup>(10)</sup>. Platelets with increased number and size of pseudopodia differ in size, possibly affecting platelet distribution width (PDW) which increases during platelet activation<sup>(5)</sup>.

An observational study conducted by Navya BN et al also correlated with our study saying low MPV and high PDW shows sensitivity for dengue fever thus reflecting a predictive marker for diagnosing dengue fever in endemic areas<sup>(1)</sup>

According to the study conducted by Jayashree K et al there was a significant association between platelet counts and severity of the disease which is similar to our study, thus concluding that platelet count can be used as predictive parameters for diagnosing DF/DHF/DSS.

Similar study was done by Bashir AB et al on control and study group and found that the MPV was decreased in cases of study group that is dengue positive cases and was normal in cases of control. PDW was normal in control group while it was increased in dengue infection, which is accordance with our study.<sup>(4)</sup>

## VI. Conclusion

1. The study focuses the importance of platelet parameters in dengue infection. Significant differences were observed in the MPV, PDW and PLT in patients with dengue infection.
2. Age group most effected was first two decades with 20% in the age group of 11-20 years and 18.09% in the age group of <10 years
3. Low platelet count, low MPV, and high PDW compared to normal may be used as probable indicators for dengue in endemic area. Low MPV <9 fl and high PDW >13fl shows considerable sensitivity for dengue fever.

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