

## Diagnostic Significance of Platelet Indices in Dengue Fever in Endemic Area

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### ABSTRACT

**AIM and Objective:** Dengue fever is one of the most common arboviral mediated outbreaks reported with increased prevalence year after year with considerable morbidity and mortality. The aim to study role of various platelet indices (MPV, PDW, PCT) in early diagnosis of Dengue fever in patient belong from endemic area, patients admitted in MBS Hospital KOTA, a tertiary care hospital in Rajasthan with a diagnosis of Dengue fever according to WHO protocol from December 2018 to January 2020

**Methods:** Prospective observational study was undertaken among adult patients in a MBS hospital Kota. 132 patients were studied and analysed. These 132 patients were grouped into three according to the platelet count (<20000, 20000-100000, >100000). The patients admitted in our hospital with features suggestive of Dengue fever were taken for the study and diagnosis was confirmed with Dengue IgM ELISA test. CBC was determined using automated counter, five-part haematology analyser in central laboratory of MBS hospital Kota.

**Result;** among 132 patients 22Patients had platelet counts below 20,000 the mean PDW was 17.29fl, 80 cases with platelet counts between 20,000 to 100000, the mean PDW was 16.5fl and 30 cases with platelet counts above 100000 the mean PDW was 13.8fl which showed statistically significant difference between the groups (p value 0.001).

The mean MPV values were 9.2fl in 22 patients with platelet counts below 20,000 and 12fl in 80 cases with platelet counts 20,000 to 100000 and 13.7fL in 30 patients with platelet count above 100000. There was statistically significant difference between the groups (p value 0.001).

The mean PCT value were 0.03% in 22 patients with platelet counts below 20,000 and 0.1% in 80 cases with platelet counts 20,000 to 100000 and 0.1% in 30 patients with platelet count above 100000. There was statistically significant difference between the groups (p value 0.001).

**Conclusions:** Platelet indices are useful parameters in dengue infection. Other than platelet count, PDW, MPV, plateletcrit are useful to monitor dengue fever. Decrease MPV, PCT and increase PDW is significant in platelet count <100000/mm<sup>3</sup> and Platelet indices plays significant role in early predictive diagnosis and severity of dengue in endemic area.

**Keywords:** Dengue, Platelet, fever, PCT, PDW, MPV

### INTRODUCTION

Dengue fever (DF) is an arthropod borne viral fever<sup>1</sup>. While dengue is endemic in more than 100 countries, most cases are reported from Southeast Asia and the western Pacific regions. Southeast Asian region together with Western Pacific region bears nearly 75% of current global disease burden<sup>2</sup>. Estimates suggest that 50 million cases of dengue infection and 500,000 cases of dengue hemorrhagic fever occur in Asian countries. India is one of the seven identified countries in the South-East Asia region regularly reporting incidence of DF/DHF outbreaks and may soon transform into a major niche for dengue infection. The first confirmed report of dengue infection in India dates back to 1946 and since then more and more new cases have been reporting the disease with increased

morbidity and mortality in both urban and rural environments<sup>1</sup>. more than 80 outbreaks have been reported from 16 States and Union Territories, the largest one being in 1996 when a severe outbreak of DF / DHF occurred in Delhi wherein about 10,252 cases and 453 deaths werereported<sup>3</sup>. Dengue infections vary in severity, ranging from influenza-like self-limiting illness to life-threatening dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) which if left untreated, are associated with case fatality rate of 5%<sup>2</sup>. Although the mortality rate for dengue cases is low, even uncomplicated dengue fever causes considerable suffering and loss of productivity despite its short duration<sup>4</sup>. The various manifestations of dengue may not have a distinct line of demarcation.

According to NVBDCP, cases are increasing from 99913 in 2015, 129166 in 2016 to 157220 in 2017. Its distribution varies from state to state. At present incidence of dengue fever is increasing rapidly in Rajasthan, dengue cases doubled within 2 year from 4043 in 2015 to 8387 in 2017<sup>3</sup>.

Recently, novel platelet indices such as MPV, PDW, and PCT have been investigated as prospective platelet activation markers<sup>4</sup>. Platelet volume, a marker of platelet function and activity is measured as mean platelet volume (MPV) by hematology analyzers. MPV can be used as in- dependent predictors of bleeding. It is surrogate marker of bone marrow activity; a high MPV indicates increased megakaryocytic activity. A low MPV indicates marrow suppression and increased risk of bleeding. Correlation of platelet count and MPV with bleeding and severity of the disease can potentially predict outcome<sup>5</sup>. Platelets with increased number and size of pseudopodia differ in size, possibly affecting platelet distribution width (PDW) which increases during platelet activation<sup>4</sup>. Furthermore, platelet activation alters the morphology of these cells, which

can be evaluated on the basis of mean platelet volume (MPV) and platelet distribution width (PDW), Another platelet parameter is plateletcrit (PCT), which is a reliable measurement of platelet biomass because it combines the MPV with the absolute platelet count<sup>6</sup>. Aim of our study to assess the role of platelet indices in the severity of dengue infection and its diagnostic significance.

## METHODS

It is a prospective observational study over a period of 13 months. A total of 132 patients admitted in medicine ward with symptoms suggestive of dengue fever and diagnosis confirmed with Dengue IgM antibody by ELISA test were included in this study. They were followed from time of admission to the time of discharge according to WHO discharge criteria.

### Inclusion Criteria:

Patients admitted with symptoms suggestive of Dengue Fever and found positive with Dengue IgM antibody by ELISA test.

### Exclusion Criteria:

- Patients with chronic kidney disease
- Patients with chronic liver disease.
- Patients with co-infections – malaria, leptospirosis, Scrub typhus

Purpose of the study will be explained to the study subjects and their attendants and written informed consent will be taken prior to their participation in the study. Pre structured proforma will be used to record the relevant information and history from individual cases selected for the study. The study was approved by hospital ethics committee and informed consent was obtained from each patient.

Descriptive statics was analysed with SPSS software and students t test was used and p value less than 0.05 was taken to indicate a significant difference.

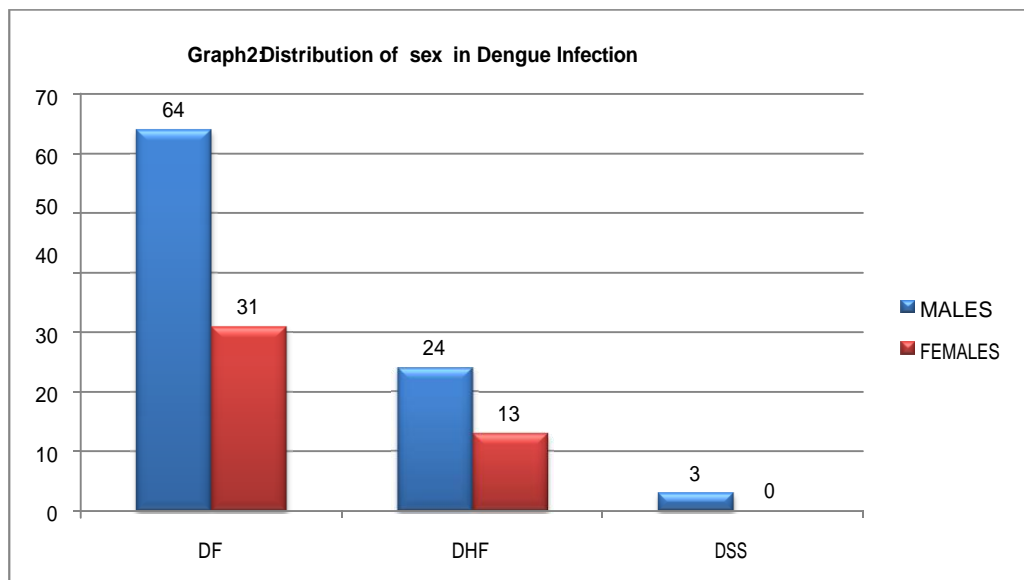
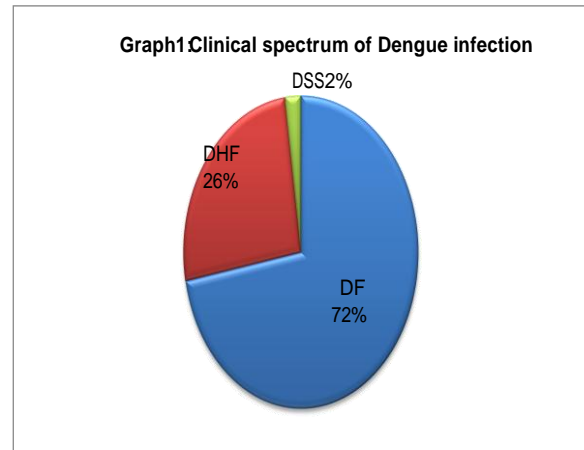
## RESULTS

132 patients were admitted in department of medicine, MBS Hospital

Kota over a period of 13 months from December 2018 to January 2020, out of which total number of patients of Dengue Fever (DF) were 95, Dengue Hemorrhagic Fever were 34 and Dengue Shock syndrome were 3 (Graph1).

Out of the total cases, 89 cases (67.4%) were Males and 43 cases (32.5%) were Females and male to female ratio was 2.1. Mean age of presentation was 37years.

Among male patients admitted, 64 cases (72.7%) had DF, 21 cases (23.8%) DHF, 3 cases (3.4%) DSS and among females 31 cases (70.4%) and 13 cases (29.5%) had DF and DHF respectively (Graph 2)



Thrombocytopenia was seen in 80 cases (84.21%) of DF, 22cases (59.45%) of DHF & DSS. Patients having platelet count of < 20000 were 22 (16.66%), 20000-100000 were 80 (60.60 %), and > 1 lakh were 30(22.7%) (Table 1).The level of thrombocytopenia was in concordance with the severity of dengue infection but there was poor relation between the level of thrombocytopenia and bleeding tendency as patients of DF who did not bleed had thrombocytopenia and in patients of DHF, bleeding manifestations did not occur even if the platelet count was less than 20000/mm<sup>3</sup>.

TABLE 1 : VARIATION IN PLATELET COUNT OF DENGUE PATIENTS

Platelet count	No. of Patients	Percentage (%)
< 20000	22	16.66
20000-100000	80	60.60
>100000	30	22.7

Platelet indices like MPV, PDW, PCT and P-LCR have been investigated as prospective platelet activation indicators.

Table 2 shows comparison of platelet indices and ratios among the three groups based on platelet count. Comparing the platelet indices, it was found that in Table 2: Comparison of the platelet indices between the three groups.

**Table 2: Comparison of the platelet indices between the three groups.**

Platelet indices	PLT<20000 N=22	PLT20000-1lkh N=80	PLT>1lkh N=30	P value
Mean of MPV	9.2	12	13.7	0.033
Mean of PDW	17.29	16.5	13.8	0.03
Mean of PCT	0.03	0.1	0.1	0.03

Patients with platelet count below 20,000 the mean PDW was 17.29fl, whereas those with platelet count between 20,000 to 100000, the mean PDW was 16.5fl and 13.8fl in those with platelet count above 100000 which showed statistically significant difference between the groups (p value 0.003).

The mean MPV values were 9.2fl in patients with platelet count below 20,000 as compared to 12fl in the platelet count group of 20,000 to 100000 and 13.7fL in patients with platelet count above 100000. There was statistically significant difference between the groups (p value 0.03).

The mean PCT value were 0.03% in patients with platelet count below 20,000 as compared to 0.1% in the platelet count group of 20,000 to 100000 and 0.1% in patients with platelet count above 100000. There was statistically significant difference between the groups (p value 0.003)

## DISCUSSION

In our study, 89 cases (67.4%) were males and 43 cases (32.5%) were females and male to female ratio was 2:1. Mean age of presentation was 37years. In a study done by Deshwal et al<sup>7</sup> mean age was 35 years, which was more than Sharma S et al (26.3 years) and Singh NP et al<sup>8</sup> (26 years) .Male to female ratio in our study was very similar to study of Kumar A et al<sup>9</sup> in which the male-female ratio was 1.82:1, and study by Aheamad et al<sup>10</sup> was 1.6:1 but in study by Singh NP et al<sup>5</sup>, it was 3:1.

Out of the total cases, 95 cases (72%) were of DF and 37 cases (28%) were of DHF & DSS. These findings were in concordance with study by RituKaroli et al<sup>11</sup>. And study by Meena KC et al<sup>12</sup> in hadoti region 84 cases (84%) were of DF and 16 cases (16%) were of DHF & DSS. Among male patients admitted, 64 cases (72.7%) had DF, 21 cases (23.8%) had

DHF, 3 cases (3.4%) had DSS. Among females 31 cases (70.4%) and 13 cases (29.5%) had DF and DHF respectively.

Thrombocytopenia as per WHO criteria, was present in 102 cases (77.23%), lower than that found by Khan et al<sup>13</sup>. Most of the patients in our study had platelet count of <50000/mm<sup>3</sup> compared to study by Khan et al<sup>13</sup> and Deshwal et al<sup>7</sup>, where most patients had platelet count < 50000/mm<sup>3</sup>. Many of the cases admitted with bleeding manifestations did not bleed subsequently though there was dip in platelet count (some even < 20000/mm<sup>3</sup>) during hospital study, indicating poor correlation between thrombocytopenia and bleeding tendencies, an observation similar to the one made by Sharma et al<sup>89</sup> indicating thereby that the abnormal platelet aggregation rather than reduction in absolute numbers was the cause of bleeding diathesis along with the cytokine mediated endothelial injury. So, in management of DF/DHF immediate replacement of plasma loss by rapid volume expanders is the most important therapy. Thrombocytopenia severity had correlation with severe types of dengue

Dengue positive cases were associated with low MPV(<13fl) and high PDW(>17fl) values in 62% cases and 55.3% cases respectively and low PCT(<0.1) value in 64.3% cases. Which is lower than study done by Navya et al.<sup>15</sup> Dengue positive cases were associated with low MPV and high PDW values in 72% cases and 92% cases respectively. A study done by Mukker et al<sup>14</sup> low MPV, high PDW and low PCT which is similar to our study which showing same variation in platelet indices in dengue positive patients. These platelet indices show sensitivity to dengue fever thus reflecting a predictive marker for diagnosing dengue fever in endemic area.

TABLE 3 : PLATELET INDICES IN PRESENT STUDY.

Platelets indices	Present study n=132 n(%)
MPV low <13 High>13	83(62) 49(37)
PDW low<17 High>17	59(44.6) 73(55.3)
PCT Low<0.1 High >0.1	85(64.3) 47(36.6)

### CONCLUSIONS

Platelet indices are useful parameters in dengue infection. Other than platelet count, PDW, MPV, plateletcrit are useful to monitor dengue fever.

Decrease MPV, PCT and increase PDW is significant in platelet count <100000/mm<sup>3</sup> and Platelet indices plays significant role in early predictive diagnosis and severity of dengue in endemic area. By the help of these parameters dengue infection in endemic area that diagnosed early and timely management can reduce both mortality and morbidity.

### REFERENCES

1. K.Parks Text Book Preventive and Social Medicine 24<sup>th</sup> edition Chapter-6.Pg.261-268
2. Sultana N, Biswas SK, Sultan T, Ahmed S, Hossain Z, Chowdhury R. Seroprevalence of dengue Fever in Chittagong, Bangladesh. *Chatt Maa Shi Hosp Med Coll J* 2013; 12(1): 38–40.doi: 10.11566/cmsh.2013.1201.38.
3. NVBDCP <http://www.Nvbdc.gov.in/den-cd.html>.
4. Vagdatli E, Gounari E, Lazaridou E, Katsibourlia E, Tsikopoulou F, Labrianou I. Platelet distribution width: a simple, practical and specific marker of activation of coagulation. *HIPPOKRATIA*.2010;14(1):28-32
5. Wiwanikit V. Mean platelet volume in the patients with dengue hemorrhagic fever. *Platelets*. 2004; 15(3):185.
6. Greisenegger S, Endler G, Hsieh K, Tentschert S, Mannhalter C, La louschek W: Is elevated mean platelet volume associated with a worse outcome in patients with acute ischemic

7. Deshwal et al. Clinical Profile Of Dengue Fever. *J Assoc Physicians India*:2015 Dec:63:30-32.
8. Singh NP, Jhamb R, Agarwal SK, Gaiha M, Dewan R, Daga MK, Chakravarti A, Kumar S. The 2003 outbreak of dengue fever in Delhi, India. *Southeast Asian J Trop Med Public Health* 2005 Sep; 36(5) :1174-8.
9. Kumar A, Rao CR, Pandit V, Shetty S, Bammigatti C, Samarasinghe CM. Clinical manifestations and trend of dengue cases admitted in a tertiary care hospital, Udipi district, Karnataka. *Indian J Community Med*. 2010 Jul;35(3):386-90. doi: 10.4103/0970-0218.69253.
10. AhemadNH, BroorS. Dengue Fever Outbreak in Delhi, North India: A Clinico-Epidemiological Study. *Indian J Community Med* 2015;40:135-8.
11. Karoli R, Fatima J, Siddiqi Z, Kazmi KI, Sultania AR. Clinical profile of dengue infection at a teaching hospital in North India. *J Infect Dev Ctries* 2012 Jul 23; 6(7):551-4.
12. Meena K.C, Jelia S, Meena S, Arif M, AjmeraD, Jatav VS. A study of hematological profile in dengue fever at tertiary care center, Kota Rajasthan, India. *Int J Adv. Med* 2016 Aug;3(3):621-624.
13. Md. Yousuf Khan, C. Venkateshwaru, N. Sandeep, A Hari Krishna. A study of clinical and laboratory profile of dengue fever in a tertiary care hospital, Nizambad, Telagana state, India. *IJCMR* 2016 Aug; 3(8):2383-2387.
14. Mukker P, Kiran S. Platelet indices evaluation in patient with dengue fever. *Int J Res Med Sci*. 2018 Jun;6(6):2054-2059
15. Navya BN, Patil S, Kariappa TM, Role of platelet parameter in dengue positive cases- an observational study. *Int J Health Sci Res* 2016;6(6):74-78.

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