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EVALUATION OF CORRELATION BETWEEN MEAN PLATELET COUNT AND OTHER PLATELET INDICES IN PATIENTS WITH DENGUE FEVER

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ABSTRACT

Introduction : Dengue fever is the most common arthropod borne disease caused by dengue virus. Decreasing platelet counts has been found to predict the severity of dengue fever . Aims and objectives of the study was to evaluate platelet indices and to found their correlation with mean platelet count which is a predictor of severity of dengue

Methods : The present study is a prospective study carried out in the Department of Medicine in a tertiary hospital in Dehradun . The study included 200 patients admitted between december 2016 to july 2018 with clinical features of dengue .

Results : A significant negative correlation was found between mean platelet count and MPV (r = - 0.247 , p = 0.004) and mean platelet count and PDW (r = -0.267, p = <0.001). A significant positive correlation was found between mean platelet count and plateletcrit (r= 0.937 , p= < 0.001).

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

INTRODUCTION

Dengue fever is the most common arthropod borne disease caused by dengue virus. Dengue virus is transmitted by Aedes mosquito ,predominantly Aedes aegypti ,Aedes albopictus (1). Dengue fever (DF) is an acute febrile disease characterized by sudden onset of fever of 3-5 days, intense headache, myalgia, joint pain, retro-orbital pain, anorexia, gastrointestinal disturbances and rash.(2). Dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) are life threatening reversible vascular complications of DF and are associated with severe thrombocytopenia, bleeding and increased vascular permeability.(3)

Decreasing platelet counts has been found to predict the severity of dengue fever and is associated with increased haematocrit and altered coagulation profile (4). Recently novel platelet indices such as MPV, PDW and P-LCR have been investigated as prospective platelet activation markers.(5) .There is a need to study platelet indices and to found their correlation between platelet count which is a predictor of severity of dengue .

Platelet Indices

Platelet indices such as MPV, PDW , Plateletcrit and P-LCR have been investigated as prospective platelet activation markers. Mean platelet volume is average size of platelets found in blood . Normal range for MPV in Indian population is from 8.6-15.5 fL. (6)

Another platelet parameter is plateletcrit (PCT), which is volume occupied by platelets in blood . The normal range for PCT is 0.22-0.24% (7,8,9,10)

Platelet distribution width (PDW) is relative width of distribution of platelets in volume index of heterogeneity of platelets. PDW varies with reference intervals ranging from 8.3 to 56.6% or 9 to 14 fl.

METHODS

A prospective study was carried out in the Department of Internal Medicine in Shri Guru Ram Rai Institue of Medical and Health Sciences , Shri Mahant Indiresh Hospital , Dehradun . The study included 200 patients admitted between december 2016 to july 2018 with clinical features of dengue (WHO definition) and serological positivity (NS1 antigen, ELISA /IgM antibody to dengue virus)

Platelet indices were measured using automated hematology analyzer.

Inclusion criteria :

1. Fever for >= 1 day
2. Both genders >= 18 years of age.
3. Positive dengue card test

Exclusion citeria :

Patients with fever but serologically negative dengue card test.

RESULTS

Baseline characteristics of patients are shown in table 1. In table 2 , age wise distribution of 200 patients is shown with maximum cases in the age group 26 – 35 years (30.5 %) and least in age group 66 -75 years (1.5 %).

Table 3 shows frequency of cases of dengue divided among different platelet indices .Table 3.1 shows frequency of dengue patients among different platelet counts with maximum number , 72 patients having platelet count between 51,000 to 100,000 and least , 21 patients with platelet counts less than 20,000.

Table 3.2 shows frequency of dengue patients among different MPV . Maximum number of patients , 149 had MPV between 9 to 12.95 fl and no patient was found with MPV less than 9 fl.

Table 3.3 shows frequency of dengue patients among different PDW . Maximum number of patients , 144 was found in group having PDW more than 14 fl and no patient had PDW less than 9 fl. Table 3.4 shows frequency of dengue patients among different plateletcrit . All 200 patients in the study had plateletcrit less than 0.20 %.

Table 4 shows correlation between mean platelet count and other platelet indices . A significant negative correlation was found between mean platelet count and MPV (r = - 0.247 , p = 0.004) and mean platelet count and PDW (r = -0.267, p = <0.001). A significant positive correlation was found between mean platelet count and plateletcrit (r= 0.937 , p= < 0.001).

Table 1 : Baseline characteristics of study population

Parameters		Mean ± S. D.
Age (years)		37.47±14.29
Gender	Male	145 (72.5%)
	Female	55 (27.5%)
Duration of illness (days)		3 ± 1.21
Platelet indices:		
1.Platelet count (per cubic mm)		32.65 ± 17.07 x 10^3
2.PDW (fl)		16.64 ± 3.59
3.MPV (fl)		12.20 ± 1.38
4.Plateletcrit (%)		0.04 ± 0.03

Table 2 : Age wise distribution of patients with dengue fever (n=200)

Age group (years)	Number of cases	Percentage
18– 25	43	21.5
26 – 35	61	30.5
36 – 45	48	24
46 – 55	30	15
56 – 65	10	5
66 – 75	3	1.5
> 75	5	2.5

Table 3 : Frequency of cases of dengue divided among different platelet indices

Table 3.1 : Frequency of dengue patients with different platelet counts

Platelet count (per cubic mm)	Frequency	Percentage
< 20,000	21	10.50
21,000 – 50,000	59	29.50
51,000 – 1 lakh	72	36
> 1 lakh	48	24

Table 3.2 : Frequency of dengue patients with different MPV

MPV (fl)	Frequency	Percentage
< 9	0	0
9 – 12.95	149	74.50
> 12.95	51	25.50

Table 3.3 : Frequency of dengue patients with different PDW

PDW (fl)	Frequency	Percentage
< 9	0	0
9 – 14	56	28
> 14	144	72

Table 3.4 : Frequency of dengue patients with different plateletcrit

Plateletcrit (%)	Frequency	Percentage
<0.20	200	100
0.20 – 0.36	0	0
> 0.36	0	0

Table 4 : Correlation between mean platelet count and other platelet indices

Parameters	Correlation coefficient , r value	p value
MPV	-0.247	0.004
PDW	-0.267	<0.001
Plateletcrit	0.937	<0.001

DISCUSSION

The baseline characteristics studied in our study population of 200 cases is shown in Table 1. Mean age in our study was 37.47 ± 14.29 years and mean duration of illness was 3 ± 1.21 days . In study by Nehara et al (2016) , mean age was 29.69 12. ± 8.7 years (11) .

Of total 200 patients included in our study , 145 (72.5%) were males and 55 (27.5 %) were females [Table 1] . The prevalence was found to be high in males. Almost similar results have been seen in other studies conducted in India and other countries. Nehara HR et al (2016) carried a study on 200 patients and found that 132 (66 %) were males and 68 (34 %) were females. Mehta SR (2018) also showed male preponderance (63 %) to females (37 %) (12).

In our study , majority of patients were found to be in third to fifth decade of life i.e . from age group 26 to 45 years (54. 5 %) and least number of patients were in 66 to 75 years age group (1.5 %) .) [Table 2] which is very similar to Mehta SR (2018) which showed maximum patients (53 %) in age group 21 to 40 years . Mukker P. et al showed maximum cases in 41 to 50 years (33.1 %) and least in 21 to 30 years (21 %).

Out of 200 patients in our study, maximum number of patients 72 (36 %) had platelet counts between 51000 and 1 lakh per cubic mm . 48 patients (24 %) had platelet counts more than 1 lakh per cubic mm ; 59 patients (29.50 %) had platelet count of between 21,000 and 50,000 per cubic mm ; while remaining 21 patients (10.50 %) had platelet counts less than 20,000 per cubic mm [Table 3.1] . The results were similar to study done by Navya BN et al which had maximum patients, 42 % with platelet counts between 51,000 and 1 lakh per cubic mm ; 24 % had platelet counts between 21,000 and 50,000 per cubic mm; 20 % had platelet counts more than 1 lakh per cubic mm and least , 14 % had platelet counts less than 20,000 per cubic mm (13).

Out of 200 patients in our study , 149 patients (74.50 %) had mean platelet volume (MPV) between 9 and 12.95 fl while 51 patients (25.50 %) had MPV more than 12.95 fl and none had MPV more than 12.95 fl [Table 3.2] . This was similar to study done by Bashir AB et al that showed maximum number of patients, 82 % having MPV between 9 and 13 fl , 17.4 % with MPV < 9fl while 0.6 % patients with MPV more than 13 fl (14).

Out of 200 patients in our study , 144 patients (72 %) had platelet distribution width (PDW) more than 14 fl ; 56 patients (28 %) had PDW between 9 and 14 fl and none had PDW less than 9 [Table 3.3] . This was similar to study done by Nehara HR et al that had 78 % patients with PDW more than 14 fl and 22 % had PDW between 9 and 14 fl . Navya BN et al study also had maximum number of patients, 92 % with PDW more than 13 fl and 8% of patients with PDW less than 13 fl. Bashir AB et al study had 67.7 % patients with PDW between 9 and 14 fl ; 27.8 % had PDW more than 14 fl and 4.5 % patients had PDW less than 9 fl.

Out of 200 patients in our study , 183 patients (91.5 %) had plateletcrit less than 0.20 % ; 17 patients (8.5 %) had plateletcrit between 0.20 and 0.36 % and none of the patients had plateletcrit more than 0.36 % [Table 3.4] . This was similar to study done by Ramamoorthy S et al that had all patients (100 %) with plateletcrit less than 0.20 % at time of bleeding manifestations (15). Mukker P et al study had maximum , 56.09 % patients having plateletcrit between 0.03 and 0.20 % ; 42 % with plateletcrit between less than 0.03 and least , 2.4 % with plateletcrit more than 0.2 %.

The correlation of platelet indices, namely MPV, PDW and plateletcrit with mean platelet count is summarized in Table 4 . A significant negative correlation was found between mean platelet count and MPV (r = - 0.247 , p = 0.004) and mean platelet count and PDW (r = -0.267, p = <0.001). A significant positive correlation was found between mean platelet count and plateletcrit (r= 0.937 , p= < 0.001). This was similar to study done by Nehara HR et al where a significant negative correlation mean platelet count and PDW (r = -0.3097, p = < 0.0017) and significant positive correlation between mean platelet count and plateletcrit (r = 0.6829, p = < 0.0001) was found. Study done by Mukker P et al showed a positive correlation between mean platelet count and MPV (p = < 0.001) and between mean platelet count and plateletcrit (p = < 0.001). Study done by Prakash GM et al showed no significant correlation between platelet count and MPV.

Present study highlighted correlation of mean platelet count with other platelet indices in dengue . Further studies are needed to asses utility of platelet indices in dengue fever.

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