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Article

Diagnostic utility of platelet parameters in dengue positive cases

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Abstract: Background: Dengue is an endemic disease in tropical and subtropical regions of the world causing severe epidemic in India and is endemic in many parts of India, especially in metropolitan cities and towns. There are evidences which states that platelet parameters may have diagnostic and prognostic value in febrile thrombocytopenia including Platelet count, Mean platelet volume (MPV), Platelet distribution width (PDW), Plateletcrit (PCT). These parameters are obtained as a part of Complete Blood Count using Automated Hematology analyzers.
Aim and Objectives: of this prospective study is 1) To evaluate the role platelet parameters in Dengue fever and also to determine the relationship of platelet parameters with platelet count and disease severity. 2) to assess the utility of platelet profile in patients with Dengue fever and understand its significance so that adverse outcomes of this rapidly spreading disease can be controlled to a greater extent.
Material and Methods: This study was conducted on 133 confirmed cases of Dengue infected patients for a period of 9 months from April 2022 to December 2022. The Platelet parameters like Platelet count, MPV, PDW and Plateletcrit were measured by using BC 300 plus Mindray Automated Hematology Analyzer on venous samples collected in K3EDTA from 133 patients and was compared with disease severity (DF/DHF/DSS) . These 133 patients were grouped into three according to platelet count (<20000, 20000-100000, >100000).
Results: Out of 133 patients, 17 patients who had platelet count <20000, the Mean MPV, PDW and PCT was 9.2 fl, 17.3 fl and 0.03% respectively, 86 patients who had platelet count between 20000-100000 the mean MPV, PDW and PCT was 12.2fl, 16.6fl and 0.1% respectively, 30 patients who had platelet count more than 1 Lakh, the mean MPV, PDW and PCT was13.7fl, 13.8 fl and 0.1% respectively which showed statistically significant difference between the groups (p value 0.003).
Conclusion: The study focuses on the importance of platelet parameters in patients with Dengue infection. Significant differences were observed in MPV, PDW and PCT in patients with dengue infection. Low platelet count, low MPV, high PDW and low PCT shows sensitivity for DF thus reflecting a predictive marker for diagnosing DF in endemic area.

Keywords: Dengue; Platelet; MPV; PDW; PCT.

1. Introduction

Dengue fever (DENV) is the most rapidly spreading mosquito-borne viral disease in the world [1]. The primary dengue vector Aedes aegypti mosquito has become widely distributed across tropical and subtropical latitudes. Based on the antigenic difference, DENV can be divided into four different serotypes, DENV 1 – 4 [2]. Severity of the illness is determined by various risk factors such as age, pre-existing illness, infecting serotype, and secondary infection. A second infection with a different serotype leads to more severe form of the disease than the primary infection [3]. One of the most common laboratory findings in dengue is thrombocytopenia [2]. Thrombocytopenia leads to bleeding although the platelet count may not directly correlate with the bleeding manifestation [4].

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% [5].

Recently, novel platelet indices such as MPV, PDW, and PCT have been investigated as prospective platelet activation markers [6]. Platelet volume, a marker of platelet function and activity is measured as mean platelet volume (MPV) by hematology analyzers. MPV can be used as independent predictors of bleeding. It is surrogate marker of bone marrow activity; a high MPV indicates increased megakaryocyte 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 [7].

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 [8].

The aim and objectives of this prospective study are:

1. to evaluate the role platelet parameters in Dengue fever and also to determine the relationship of platelet parameters with platelet count and disease severity,
2. to assess the utility of platelet profile in patients with Dengue fever and understand its significance so that adverse outcomes of this rapidly spreading disease can be controlled to a greater extent.

2. Material and methods

This study was conducted on 133 confirmed cases of Dengue infected patients for a period of 9 months from April 2022 to December 2022. The Platelet parameters like Platelet count, MPV, PDW and Plateletcrit were measured by using BC 300 plus Mindray Automated Hematology Analyzer on venous samples collected in K3EDTA from 133 patients and was compared with disease severity (DF/DHF/DSS). These 133 patients were grouped into three according to platelet count (<20000, 20000-100000, >100000).

2.1. Inclusion criteria

All the patients with clinical manifestations and positive Dengue infection cases on serology were included in the study.

2.2. Exclusion criteria

Patients negative for Dengue infection on serology were excluded from the study and if routine laboratory testing suggested bacterial, parasitic or any viral infection or any other disease and patients on antiplatelet drugs and drugs causing thrombocytopenia were excluded from the study.

2.3. Study Design

Prospective.

2.4. Study location

Tertiary care hospital based study conducted in Department of Pathology, Dr V.R.K Women's Medical College, Aziz Nagar, RR District.

2.5. Study duration

Nine months from April 2022 to December 2022.

2.6. Sample size

133 cases.

2.7. Limitation

Small sample size.

2.8. Consent

Purpose of the study explained to the study subjects and their attendants and written informed consent taken prior to their participation in the study. Pre structured proforma 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.

Statistical analysis was done with SPSS software and students 't' test was used and p value less than 0.05 was taken to indicate a significant difference.

3. Results

Out of total 133 cases, 116 (87.22%) cases were of DF, 17 (12.78%) of DHF and there was no case of DSS. Out of total cases,72 (54.14%) cases were male and 61(45.86%) were female and male to female ratio was 1.2: 1. Mean age at presentation was 29 years.

Patients having platelet count < 20000/cu.mm were 17(12.78%), 20000-100000/cu.mm were 86(64.66%) and > 1 lakh/cu.mm were 30(22.56%). The level of thrombocytopenia was in accordance with disease severity but there was a poor correlation between 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 with thrombocytopenia <20000/cu mm.

Platelet indices like MPV, PDW and PCT has been evaluated as prospective platelet activation indicators. Platelet count results were grouped into three groups which is depicted in Table 1.

Table 1. Alteration in platelet count in Dengue positive cases

Platelet count	Number of patients	Percentage%
<20000/cu.mm	17	12.78%
20000-100000/cu.mm	86	64.66%
>1 lakh/cu.mm	30	22.56%

Table 2. shows comparison of platelet indices between three groups

Platelet indices	PC <20000/cu.mm N=17	PC 20000-1 Lakh/cu.mm N=86	PC >1 Lakh/cu.mm N=30
Mean of MPV	9.2 fl	12.2 fl	13.7 fl
Mean of PDW	17.3 fl	16.6 fl	13.8 fl
Mean of PCT	0.03 %	0.1 %	0.1 %

PC-Platelet count, MPV-Mean Platelet Volume, PDW-Platelet distribution width, PCT-Plateletcrit.

In patients with platelet count below 20000 Mean MPV value was 9.2 fl, 12.2 fl in platelet count group 20000-100000 and 13.7 fl in patients with platelet count above 1 lakh. Statistically significant difference was noted between the groups (p value 0.003). In patients with platelet counts less than 20000 the Mean PDW was 17.3 fl whereas those with platelet count between 20000-100000, the mean PDW was 16.6 fl and in those above 1 lakh, Mean PDW was 13.8 fl showing statistically significant difference between the groups (p value 0.003).

The Mean PCT value was 0.03% in patients with platelet count below 20000, 0.1% in platelet count group 20000-100000 and 0.1% in platelet count group above 1 lakh showing statistically significant difference between the groups(p value 0.003).

4. Discussion

In our study, 72(54.14%) cases were male and 61(45.86%) cases were female and male to female ratio was1.2:1. Mean age at presentation was 29 years which was similar to study done by Sharma S et al. [9] (26.3years) and Singh NP et al. [10] (26 years). Male:Female ratio was similar to the study done by Ahemad et al. [11] 1.6: 1.

Out of the total cases, 116 (87.22%) cases were of DF and 17(12.78%) cases were of DHF and there was no case of DSS which were in concordance with the study done by Meena K C et al. [12] in Hadoti region 84 cases (84%)were of DF and 16 (16%) were of DHF and DSS.

Most of the patients in our study had platelet count<50000/cu.mm compared to study by Khan et al [13] and Deshwal et al [14] where most patients had platelet count <50000/cu.mm. Most of the cases admitted

with bleeding manifestations did not bleed subsequently because of abnormal platelet aggregation rather than reduction in absolute numbers an observation similar to the one made by Sharma S et al. [9].

Dengue positive cases were associated with low MPV(<13fl) and high PDW(>17fl) values in our study in 82% and 90% of cases respectively. Mukker et al [15] observed that MPV(<13fl) was decreased, PDW (>17fl) was increased and PCT (<0.1%) was decreased in Dengue positive cases which is in concordance with our study. In study conducted by Navya et al [16], Dengue positive cases were associated with decreased MPV and increased PDW values in 72% and 92% cases respectively which is in concordance with our study where decreased MPV found in 82% of cases and increased PDW in 90% of cases thus reflecting a predictive marker for diagnosing Dengue fever in endemic area.

5. Conclusion

The study focuses on the importance of platelet parameters in patients with Dengue infection. Significant differences were observed in MPV, PDW and PCT in patients with dengue infection. Low platelet count, low MPV, high PDW and low PCT shows sensitivity for DF thus reflecting a predictive marker for diagnosing DF in endemic area.

Author Contributions: All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript.

Conflicts of Interest: The authors declare that they do not have any conflict of interests.

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