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ROLE OF MEAN PLATELET VOLUME (MPV) IN ASSESSING THE SEVERITY OF DENGUE.

Pathology

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ABSTRACT

Background: Dengue is common viral infection which is has seasonal outbreak and has big burden on the health sector in our country. The patients presents with fever, arthralgia, malaise along with other symptoms in case of dengue haemorrhagic fever. The patients have thrombocytopenia along with leucopenia. Recently lot of importance has been given to platelet indices for assessing severity of dengue infection. Aim was to study the significance of mean platelet volume (MPV) is assessing the severity of dengue infection.

Methods: The present study is a prospective observational study conducted in a tertiary hospital in Navi Mumbai among 300 patients positive for dengue fever with thrombocytopenia. Their complete hemogram was performed and MPV was compared with the platelet count. Categorical data were presented as numbers (percent) and were compared among groups using Chi-square test. Groups compared for demographic data were presented as mean and standard deviation and were compared using student t-test using SPSS, version 20 for Windows. P value of <0.05 was statistically significant

Results: The most common clinical feature in patients with dengue after fever was Arthralgia 73.2 %. NS1 was positive in 71% of the cases. 41% patients had platelet count between 50,000-1 lac. The mean MPV was 7.28 fl and total leucocyte count 3446 cells/cumm.

Conclusion: The mean platelet volume decreases with decrease in platelet count observed in dengue fever, which can help in predicting the severity of dengue infection.

KEYWORDS

INTRODUCTION:

Dengue infection is caused by mosquito Aedes Aegypti which causes febrile illness in human and has become serious health problems in subtropical countries mostly in urban areas.[1]Dengue virus has four serotypes, (DEN1, DEN2, DEN3, DEN4) this viral infection is mostly transmitted during rainy and after rainy season due to conducive environment factors available for the growth of dengue virus.[2] Clinically, dengue infection is manifested by mild forms of febrile illness to very dangerous DHF/DSS. It has high mortality rate if it is left untreated. Once a person is infected by dengue virus, the person develops the symptoms & signs followed by incubation period of 3-14 days. These patients usually have high grade fever which lasts for roughly about a week. Later fever drops for few days and then relapses. The patients presents with intense malaise, joint pain, retro-orbital pain, abdominal pain and nausea vomiting. Pharyngitis is also additional feature may be seen in patient. Also many people develop rash, petechiae during the course of illness or after the course of illness. The virus can be detected in blood, plasma, serum and other body tissues for a duration of 5-6 days, in late stages of infection, serology is choice of investigation. The common investigations used for diagnosis of dengue are detection of antigens, antibodies, viral nucleic acids and both. People who are infected with dengue virus, their cells secrete NS1 antigen in high proportion in the blood.[3] Other confirmatory investigations are RT-PCR, MAC ELISA, Ig M ELISA, nucleic acid amplification tests (NAAT), virus isolation and virus culture and IgG/IgM ratio.[4] In dengue virus infection there is significant decrease in platelet count, total leucocyte count along with deranged haematological parameters.[5] The Mean platelet volume (MPV), changes which occurs during dengue viral infection and its role in severity of dengue viral fever. Mean platelet volume (MPV) by acts as a function of platelet activity. MPV can be used as a indicator to analyse for future bleeding of dengue patients. If MPV is increased, it points towards increased megakaryocyte activity. Risk of bleeding is usually due to bone marrow suppression and this can be easily indicated by low MPV. Many recent studies have been done on platelet parameters and its significance in dengue viral fever / Dengue haemorrhagic fever, whether these parameters could predict the outcome and severity of dengue viral fever/ dengue haemorrhagic fever.

MATERIAL AND METHOD:

This was a prospective study performed between January 2018 to July 2019. A total of 300 cases were evaluated in our study who were admitted with history of fever and symptoms of dengue. Records of the patient's history was attended from the MRD section. The patients whose had history of fever along with symptoms of dengue fever. Patients were positive to serological test like NS1 antigen/ELISA IgM and IgG and their complete blood count along with other haematological test were performed. Dengue test was performed on Dengue Day 1 test kit which contained NS1 antigen and IgM/IgG antibodies in human serum/plasma.

Inclusion criteria:

1. All the patient who were seropositive for NS1 antigen/ IgM /IgG and thrombocytopenia (platelet count less 1,50,0000)

Exclusion criteria :

1. Patients who had dengue but not thrombocytopenia were excluded from the study
2. Patients who had other chronic disease or any active infection along with dengue were excluded or any recent transfusion history.

RESULTS:

Total 300 patients were studied.

Table no 1: Distribution of clinical features

Clinical features	Percent
Fever	100
Arthralgia	73.2
Malaise	65.6
Headache	56
Abdominal pain	41.33
Vomiting	30.6
Petechie/purpura	9.67
Ascities/Pleural Effusion	12.67
Rash	9.3
Hypotension/Tachycardia	3

Fever was the most common presenting symptom followed by arthralgia. Petechie was the most common haemorrhagic manifestation. Dengue haemorrhagic fever patient presented with ascities and pleural effusion.

Table no 2: Distribution of NS1/ IgM/IgG positive cases

Serological investigation	Percent
Ns1 positive	71
IgM positive	14
IgG positive	2
Both NS1 positive & IgM positive	15

Most patients were positive for NS1 antigen followed NS1 and IgM antibody.

Table no 3:Distribution of platelet counts

Platelet count	Percent
Less than 50K	35.0
50k to 1lakh	41.0
1 to 1.5lakh	24.0
Total	100.0

Platelet count between the range of 50,000 -1 lac was the most common group of thrombocytopenia among dengue positive patients.

Table no 4: Distribution of haematological parameters

	Mean	Std. Deviation	p value
Hemoglobin	12.89	2.81	0.761
PCV	44.1	359.45	0.296
Platelet count	61.3	0.38	0.193
MPV	7.28	1.68	0.28
Total WBC count	3990.20	1899.31	0.289

In this study, the mean haemoglobin count was 12.89 gm/dl. Haemoconcentration was not observed in our study except in few cases of dengue haemorrhagic fever. Mean MPV was 7.28 fl which was on a lower side. The mean total leucocyte count was also decreased.

Table no 5: Platelet wise distribution of hematological parameters.

platelet count	< 20		21 to 50		50 to 1 lakh		> 1 lakh		P value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pcv	43.2	7.37	38.65	7.65	36.93	351.92	36	542.93	.741
Mpv	5.52	0.73	6.16	0.97	7.39	1.27	8.59	1.87	.000
total count	3446.92	1756.86	3911.88	2438.00	4173.66	1889.12	4213.14	1187.03	.131
Plt	0.10	0.04	0.37	0.09	0.74	0.14	1.22	0.17	.000

In our study in the platelet count less than 20,000, the mean MPV was 5.52 fl which was significantly low, the mean total leucocyte count was also low. Among the platelet count 20,000-50,000 the total leucocyte count was on the lower side with MPV being on lower range. Between the platelet count of 50000-1,50,000, total leucocyte count was in lower side of normal range and MPV was also decreased.

Table no 6: Distribution of MPV among Dengue fever and dengue haemorrhagic fever.

Diagnosis	MPV(Less than 9fl)	MPV(more than 9 fl)	Total
DF	83.96	16.14%	100%
DHF	100%	0%	100
Total	86%	14%	100%

In our study among dengue among dengue fever, MPV was low in 83.96% of the cases and high in 16.14% of the cases. In dengue haemorrhagic fever, MPV was low in 100% of the cases. (p value of 0.0078)

DISCUSSION

There are various derangement in dengue viral fever such as thrombocytopenia, leucopenia, haemoconcentration. Recently Mean platelet volume (MPV) has been used as a marker to assess the severity and prognosis of the dengue fever as well as dengue haemorrhagic fever.

Mean platelet volume (MPV) by acts as a function of platelet activity. MPV can be used as a indicator to predict bleeding in dengue patients. If MPV is increased, it points towards increased megakaryocyte activity. Risk of bleeding is usually due to bone marrow suppression and this can be easily indicated by low MPV.[6]

When MPV is analysed in normal subjects, it is inversely proportional to the platelet count. In bone marrow failure and anaemic conditions like megaloblastic anaemia MPV values decreases. Whenever there are large platelets, there is increase in MPV, as these large size platelets are active in functions than the usual one. In conditions like inherited macrothrombocytopenia, MPV is usually increased. In myeloproliferative conditions MPV values are usually high.[7]

MPV can be calculated from the analyser by platelet distribution curve. Megakaryocytes, platelet number are regulated by cytokines such as IL-6, IL-3 and thrombopoietin, all these factors are associated with MPV, these factors are responsible for formation of large platelets as well. Increase in level of MPV is seen due to large platelets. Large platelets is formed due to increase in size of immature platelets. Such large platelets are more active in nature. Platelet activation and platelet production rate can be easily indicated by MPV. Raised MPV levels indicates that there is increase in the diameter of platelet.[8]

Mean platelet volume (MPV) by acts as a function of platelet activity. MPV can be used as a indicator to analyse for future bleeding of dengue patients. If MPV is increased, it points towards increased megakaryocyte activity. Risk of bleeding is usually due to bone marrow suppression and this can be easily indicated by low MPV.[6] Decrease MPV indicates suppression of bone marrow and risk of bleeding raised. Platelet count and level MPV can predict bleeding severity.[6,8] MPV is a good indicator of bone marrow activity.[9] In high grade inflammatory disorders there is consumption of large platelets, which leads to decrease in MPV seen in dengue viral infection, in contrast when there is low grade inflammatory disorder it leads to increase in MPV which is due to activation of platelets. If MPV is decreased it indicates there is marrow suppression, but increase MPV indicates platelet activation which can be also seen in improvement of the infection as is increase in platelet count which can be observed in dengue fever when platelet counts are improving.[10]

Our findings of MPV correlated with study done by Navya et al, where she found low MPV(<9fl) in 68.8 % in dengue fever and 100% in DHF. A high MPV (>9fl) was noted among 31.1% of the total dengue fever population and 0 % among DHF.[6]

A study by Bashir AB et al observed that patients with dengue fever had lower levels of MPV and platelet count and among control group it was normal range.[8]

In a study conducted by Hardeva RN et al showed significant correlation between platelet counts and severity of the disease. Low platelet count, low MPV, low PCT, high PDW and high P-LCR shows considerable sensitivity and specificity for dengue fever and can be used as a predictor of severity of dengue infection.[11]

In a study conducted by Mukker P et al. 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 13.8fL in patients with platelet count above 100000. MPV decreased with decreasing platelet count.[12]

CONCLUSION

Mean platelet volume is easily available parameter in the advanced hematological analyser. A he burden of dengue positive cases is high with high burden on the medical infrastructure , this easily available parameter can be helpful in predicting the severity of the dengue positive cases.

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