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Original Research Article.

A Study of Evaluation of Platelets as a Predictive Parameters in Severe Dengue Fever

Sumit Kumar Bochiwal[1], Vishakha Vinod[2*], Deepak Shukla[3]

[1]Assistant Professor, Department of Medicine, Pacific Institute of Medical Sciences, Udaipur, Rajasthan, India.
[2]Senior Resident, Department of Medicine, SMS Medical college and Hospital, Jaipur, Rajasthan, India.
[3]Associate Professor, Department of Medicine, SMIMER, Surat, Gujarat, India.

ABSTRACT

Introduction: Dengue fever is a common arthropod borne viral fever presenting with thrombocytopenia. There are number of studies on thrombocytopenia and its correlation with severity of dengue fever, but results are conflicting. We want to study level of platelet count and its correlation with various complications of dengue like bleeding, DIC, hepatitis, shock etc. We would also like to evaluate platelet trends (increasing or decreasing) with various complication and outcome.

Methods: It was prospective observational study over the period of one year. 90 Indoor patients with dengue with thrombocytopenia were studied after inclusion and exclusion criteria. Data entry and analysis was done in Microsoft excel through Descriptive statistic, 't' test and chi-square tests.

Results: In uncomplicated cases the mean platelet count was 54077± 42277 and in complicated cases the mean platelet count was 29500± 23197. This signifies platelet count were low in complicated dengue fever. This suggests that platelet count is surrogate marker of severity of dengue fever. With improving platelet count, most of patients survived, while patients with decreasing trend suggested poor outcome (p: <0.01) with 53-time higher chances of expiring as compared to patient with increasing trend of platelet (odd ratio:53.64). Severe thrombocytopenia was related with high mortality rate.

Conclusion: From this study, we recommend that absolute platelet count & more specifically change in platelet count trend (increasing or decreasing) should be monitored closely as it can be used as a predictor of severity of dengue fever.

Keywords: Platelets, Dengue Fever, Thrombocytopenia.

***Correspondence to:**

Dr Vishakha Vinod,
Senior Resident,
Department of Medicine,
SMS Medical college and Hospital,
Jaipur, Rajasthan, India.

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INTRODUCTION

Dengue fever is an arthropod borne viral fever. It is acquiring epidemic proportion in this part of world and it has become major public health problem with significant mortality. Estimates suggest that 50 million case of dengue infection and 500,000 cases of dengue hemorrhagic fever occur in Asian countries. It is vital to recognize the warning sign and symptoms, alteration in biochemical parameters and multisystem involvement pattern in dengue to reduce the mortality. In dengue fever thrombocytopenia occurs due to

- Bone marrow suppression.
- Immune mediated reaction by antiplatelet anti body
- Endothelial dysfunction

There are number of studies on thrombocytopenia and its correlation with severity of dengue fever, but results are conflicting. We want to study level of platelet count and its correlation with various complications of dengue like bleeding, DIC, hepatitis, shock etc. We would also like to evaluate platelet trends (increasing or decreasing) with various complication and outcome.

AIMS AND OBJECTIVES

Primary

- Correlation of platelet count and its trend with its complications and outcome in Dengue fever.

Secondary

- To study various clinical manifestations of dengue.
- To study various complications of dengue fever including DHF and DSS.

MATERIALS AND METHODS

The study was conducted among indoor patients admitted to our tertiary care hospital. It was prospective observational study over the period of one year.

Inclusion Criteria

1. All adult patients admitted with diagnosis of Severe Dengue Fever (WHO Criteria)

a) Clinical criteria: (Patient live in dengue endemic area)

Fever and 2 of the following criteria:

- Anorexia and nausea
- Rash
- Aches and pain
- Leukopenia
- Tourniquet test positive

Warning sign:

- Abdominal pain and tenderness
- Persistent vomiting
- Ascites/ pleural effusion
- Mucosal bleed
- Lethargy, restlessness
- Liver enlargement> 2cm
- Increase in HCT concurrent with rapid decrease in platelet count

(b) Laboratory Criteria: (Confirmatory criteria)

- Dengue NS-1 Antigen detection {ELISA}
- IgM ELISA (by paired sera)

(*Any one of the above)

2. All patients >18 years of age willing to participates in this study.

Exclusion Criteria

1. Fever with any other identified specific cause was excluded from the study.

2. Dengue fever with any other identified specific cause was excluded from the study. (Mixed infection)

Sample size calculated by considering the proportion of severe dengue fever 12.5%

p = 12.5%; q = 1-p

$Z_{\alpha/2}$ = level of significance= 95% =1.96

L = allowable error=7%

$$n = \frac{Z_{\alpha/2}^2 pq}{l^2} = \frac{4pq}{l^2}$$

=89

90 patients, who presented with clinical features such as fever, headache, joint pain, and bleeding manifestations admitted to hospital (WHO criteria of dengue fever) were included in the study.

For all cases, IgM Dengue (by ELISA test) and Dengue NS-1 Antigen (by ELISA) were done.

Data was entered in MS EXCEL Spread sheet and analyzed with the help of Openepi & SPSS software

RESULTS AND DISCUSSION

Age-wise sex distribution among cases

Table 1 shows that in the age range of 21-30 years 75% males and 55% females were there. In the 31-40 years range 18% and 12%, in 41-50 years range 0% and 36%, 51 -60% range 2% and 0% and in 61-70 years range 2% and 3% males and females were there respectively.

Maximum cases were between 20-40yrs of age. In the age group of > 40 years, only 7% males and 9% females were there. Similar types of observation were there in study done by Keshva et al.

Clinical manifestations of patients with dengue fever

In present study, 90(100%) cases presented with the complained of fever, 70 (78%) cases presented with anorexia and nausea, 69 (77%) cases presented with body ache and pain, 65(72%) and 58(64%) cases presented with abdominal pain and persistent vomiting respectively, 12(13%) and 15(17%) cases presented with rash/ patechaie and bleeding (haematemesis, malena, epistaxis) respectively,4 (5%) cases presented with free fluids(pleural effusion, ascites), 3(4%) cases presented with breathlessness ,2(2%) and 2(2%) cases presented with tourniquet test positive and decrease urine output respectively. 1(1%) case presented with convulsion.

Most common presenting clinical features was fever (100%) followed by anorexia, nausea, vomiting, abdominal pain and body ache. Other presenting features were bleeding, rash, patechaie, free fluids, breathlessness, and convulsion. Similar results were observed in a study conducted by Keshva el al and Agarwal A. In these studies, the most common presenting features were fever, nausea, vomiting, body ache, and pain in abdomen.

Similar results were observed in a study conducted by Md. Yousuf Khan et al, and C. Venkateshwarlu et al. In these studies, the most common presenting features were fever, nausea, vomiting, and pain in abdomen.

Severity of disease According to WHO classification

In present study, out of 90 cases, 74 (82%) were having dengue fever, 12 (13%) were having dengue hemorrhagic fever and 4(5%) were having dengue shock syndrome.

Similar results were seen in study done by Nandini Chatterjee et al and Mainak Mukhopadhyay et al, in which 12% cases of dengue having DHF and DSS. DHF was found in 14% of the patients in study conducted by Vanamali D R et al, and 12.6% in study conducted by Sharma et al.

Distribution of cases according to lowest platelet count and severity of dengue fever (DHF/DSS)

In present study, 3(30%) cases having Platelet count <10000 developed complications and 7 (70%) were uncomplicated, 3(25%) were having Platelet between 10000-20000 developed complication and 9 (75%) were uncomplicated, 5(20%) were having Platelet between 20000 – 50000 developed complication and 20(80%) were uncomplicated, 4(16%) were having Platelet between 50000-100000 developed complication and 20 (84%) were uncomplicated, 1(5%) were having platelet count >100000 developed complication and 18(95%) were uncomplicated.

In uncomplicated cases the mean platelet count was 54077± 42277 and in complicated cases the mean platelet count was 29500± 23197. This signifies platelet count were low in complicated dengue fever with statistical significance as compared to Uncomplicated dengue fever (p value<0.01). This was comparable with study done by K. Jayashree et al, G. C. Manasa et al, and P. Pallavi et al.

This suggests that complications are more commonly seen when there is severe thrombocytopenia.

Platelet trend in first 4 days and its relation with outcome

In present study, 74 cases showed increasing trend of platelet, out of which 74 (100%) survived. Total 16 cases showed decreasing trend of platelet, out of which 12 (75%) survived and 4(25%) expired. This suggests that increasing platelet trend was associated with 100% survival rate. And decreasing platelet trend was associated with 75% survival rate and 25% mortality.

Platelet count is surrogate marker of severity of dengue fever. As platelet count improving, most of patient survived, while patient having decreasing trend suggestive of poor outcome. (p: <0.01)

Patient with decreasing trend of platelet have 53-time higher chances of expiring as compared to patient with increasing trend of platelets. (Odd ratio: 53.64).

Lowest Platelet count related with outcome

In present study, 10 cases were having lowest Platelet count <10000, in which 9(90%) survived and 1(10%) expired.12 cases were having lowest Platelet count between 10000-20000, in which 10(84%) survived and 2(16%) expired. 25 cases were having lowest Platelet count between 20000 – 50000, in which 24(96%) survived and 1(4%) expired. 24 cases were having lowest platelet count between 50000-100000, in which all patient survived and there was no mortality. 19 Cases were having platelet count >100000, in which all patient survived and there was no mortality. Thus, severe thrombocytopenia was related with high mortality rate.

Platelet count at admission, compared with other study

In present study, 16% cases were having Platelet <20000, 19(21%) were having Platelet between 20000 – 50000, 27(30%) were having Platelet between 50000-100000 and 30(33%) were having platelet count >100000.

This is comparable with study done by Md. Yousuf Khan et al, and C. Venkateshwarlu et al.

The lowest platelet counts and severity of dengue fever (DHF/DSS) compared with other study

In present study, patients with platelet count <50000 had more chances to develop complicated dengue fever which is comparable to study by Navya B.N. et al.

Table 1: Age wise sex distribution among cases

Age in Years	Male cases (%)	Female cases (%)
21-30	43 (75%)	18 (55%)
31-40	10 (18%)	12 (36%)
41-50	0 (0%)	2 (6%)
51-60	3 (5 %)	0 (0%)
61-70	1 (2%)	1 (3%)
Total	57 (100%)	33 (100%)

Table 2: Clinical manifestations of patients with dengue fever

Clinical features	No. of cases	Percentage (%)
Fever	90	100%
Anorexia and nausea	70	78%
Rash/petechiae	12	13%
Body ache/pain	69	77%
Abdominal pain	65	72%
Persistent vomiting	58	64%
Free fluids	4	5%
Bleeding	15	17%
Tourniquet test positive	2	2%
Decrease urine output	2	2%
Breathlessness	3	4%
Convulsion	1	1%

Table 3: Severity of disease according to WHO classification

Severity	No. of cases	Percentage
Dengue fever (DF)	74	82%
Dengue haemorrhagic fever (DHF)	12	13%
Dengue shock syndrome (DSS)	4	5%

Table 4: Distribution of cases according to lowest platelet count and severity of dengue fever (DHF/DSS)

Lowest platelet count	Complicated (DHF/DSS)	Uncomplicated (DF)
<10000	3 (30%)	7 (70%)
10000-20000	3 (25%)	9 (75%)
20000-50000	5 (20%)	20 (80%)
50000-100000	4 (16%)	20 (84%)
>100000	1 (5%)	18 (95%)
Total	16 (18%)	74 (82%)

Table 5: Platelet trend and its relation with outcome

Platelet trend in first 4 days	No. of cases	Survivor (%)	Expired (%)
Increasing	74	74 (100%)	0 (0%)
Decreasing	16	12 (75%)	4 (25%)

P value :< 0.01
Odd ratio: 53.64

Table 6: Lowest platelet count related with outcome

Lowest Platelet count	No. of cases	Survivor	Expired
<10000	10	9 (90%)	1 (10%)
10000-20000	12	10 (84%)	2 (16%)
20000-50000	25	24 (96%)	1 (4%)
50000-100000	24	24 (100%)	0 (0%)
>100000	19	19 (100%)	0 (0%)
Total	90	86	4

Table 7: Platelet count at the time of admission, compared with other study:

Platelet count	Present study	Md. Yousuf Khan study
<20000	16%	15%
20000-50000	21%	41%
50000-100000	30%	28%
>100000	33%	16%

Table 8: Lowest platelet counts, and severity of dengue fever (DHF/DSS) compared with other study:

Lowest platelet count	Present study		Navya B.N. study	
	Uncomplicated	**Complicated**	**Uncomplicated**	**Complicated**
<20000	16 (19%)	6 (42%)	10(11%)	4(40%)
20000-50000	20 (24%)	5 (35%)	20(22%)	4(40%)
50000-100000	20 (24%)	4 (25%)	40(43%)	2(20%)
>100000	18 (22%)	1 (6%)	20(22%)	0(0%)

SUMMARY

- The study was carried out at Tertiary Care Hospital, Surat over the duration of one year in which, study of platelet counts and its correlation with severity of dengue fever was studied and analyzed.
- A total of 90 cases were studied.
- Most of the patients were between 21- 30 years. The second common age groups of patients were from the age group of 31-40 years. Mean age of the study population was 29 years.
- In our study, out of 90 cases, 57 (63%) were male and 33 (37%) were female.
- Most common presenting clinical features was fever (100%) followed by anorexia, nausea, vomiting, abdominal pain and body ache. Other presenting features were bleeding, rash, patechaie, free fluids, breathlessness, and convulsion.
- Out of 90 cases, 74 (82%) were having dengue fever, 12 (13%) were having dengue hemorrhagic fever (DHF), and 4(5%) were having dengue shock syndrome (DSS).
- Increased bilirubin was not commonly seen in dengue fever and dengue hemorrhagic fever. It was increased only in dengue shock syndrome patients.
- Most of the patients of dengue were having mild elevation of liver enzymes. Out of these all the patients having SGOT/SGPT levels <1000 completely recovered, and 4 (50%) out of 8 patients with SGOT/SGPT >1000, expired.
- Most of the patients were found to have hemoglobin concentration in the range of 13 – 17 gm/dl.
- Hemoconcentration was not commonly seen with severe dengue fever in the present study. This may be because of low baseline Hb in the study population.
- One patient having WBC count<4000 expired. No mortality was seen in patients having WBC count between4000-11000. And 3 out of 6 patients expired in which WBC count >11000. Most of the patient who died had either leucocytopenia or leucocytosis.
- In uncomplicated cases the mean platelet count was 54077± 42277 and in complicated cases the mean platelet count was 29500± 23197. This signifies platelet count were low in complicated dengue fever.
- This suggests that complications are more commonly seen when there is severe thrombocytopenia.
- Platelet count is surrogate marker of severity of dengue fever. As platelet count improving, most of patient survived, while patient having decreasing trend suggestive of poor outcome (p: <0.01). Patients with decreasing trend of platelet have 53-time higher chances of expiring as compared to patient with increasing trend of platelet (odd

ratio:53.64). Severe thrombocytopenia was related with high mortality rate.

- The most common complication noticed was acute hepatic failure (9%) followed by hypotension (5%) & acute renal failure (2%).

CONCLUSION

From this study, we conclude that absolute platelet count & more specifically change in platelet count trend (increasing or decreasing) should be monitored closely as it can be used as a predictor of severity of dengue fever.

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