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PLATELET INDICES AND DEMOGRAPHIC CORRELATES AS PREDICTIVE INDICATORS OF SEVERITY MANIFESTATIONS IN DENGUE FEVER: A PROSPECTIVE OBSERVATIONAL STUDY

Vishal Kumar C J[1], Suma H V[2], H K Manjunath[3], Bhargavi Mohan[4], Manasa R S[5], Ragini A K[6], Sudhamani[7], Tejas R[8]

[1]*Intern (Undergraduate), BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India*
[2]*Assistant Professor, Department of Pathology, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India*
[3]*Professor and HOD, Department of Pathology, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India*
[4]*Professor, Department of Pathology, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India*
[5]*Postgraduate student, Department of Pathology, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India*
[6] *Professor and HOD, Department of Microbiology, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India*
[7]*Associate Professor, Department of Microbiology, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India*
[8]*Undergraduate student, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India*

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Corresponding Author:
Dr. Suma H V, Assistant Professor, Department of Pathology, BGS GIMS, Bengaluru, India
Email: sumavenugopal16@gmail.com

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ABSTRACT

Background: Dengue fever is a major vector-borne viral illness associated with significant morbidity and mortality worldwide. Haemorrhagic complications represent the most dangerous outcomes, with thrombocytopenia as a defining feature. Platelet indices - Mean Platelet Volume, Platelet Distribution Width may serve as reliable early markers of severe disease. the objective is to evaluate changes in platelet indices among dengue patients, assess the role of age and gender in thrombocytopenia, and determine their predictive potential for dengue haemorrhagic fever.

Materials and Methods: A prospective observational study was conducted at a tertiary care hospital between May 2023 and August 2023. 240 patients with dengue-like symptoms were screened, out of which 129 serologically confirmed dengue positive patients were enrolled with informed consent. Demographics and platelet indices were recorded and analysed using SPSS Software with relevant tests.

Results: Significant thrombocytopenia was noticed more in younger and older age groups with around 32% of the total sample falling between the <20,000 to 50,000cells/µL, when compared to middle age groups ($p < 0.05$). There were no significant variations among males and females ($p > 0.05$). Significant difference in the mean PCT noted between subjects of different age groups.

Conclusion: Younger and older age groups are more likely to experience significant thrombocytopenia. Monitoring platelet count in these high-risk groups should remain central to management. Plateletcrit was found to be a promising index. MPV and PDW did not provide clinically meaningful prognostic value. Routine integration of MPV and PDW into dengue monitoring protocols is not recommended.

Keywords: Dengue, Thrombocytopenia, MPV, PDW, PCT.

INTRODUCTION

Dengue fever is a major vector-borne viral illness caused by the dengue virus of the Flaviviridae family and is transmitted primarily by Aedes aegypti and Aedes albopictus mosquitoes. According to the World Health Organization, there are approximately 5.2 million reported infections annually, with more than 5,000 dengue-related deaths across nearly 80 countries. The disease is endemic in more than 100 countries and India contributes a significant share of the global burden.[1]

The clinical spectrum of dengue ranges from mild febrile illness to severe complications such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Severe dengue is characterized by plasma leakage, bleeding, and organ impairment. Thrombocytopenia and platelet dysfunction play a major role in these complications. Because bleeding risk is not always explained by platelet count alone, additional prognostic markers are needed.[2] Platelet indices have been studied for their potential role in dengue assessment. Reducing platelet count have been found to be associated with increasing severity of dengue along with alteration in coagulation profile which in-turn leading to increased bleeding tendencies.[3] Thrombocytopenia in viral illness like dengue is because of virus induced platelet destruction and apoptosis along with bone marrow suppression. In response, bone marrow gets activated resulting in increased giant platelets which is represented by increased MPV.[4] Increased MPV indicates increased bone marrow activity and decreased MPV indicates bone marrow suppression.[4,5] Platelet activation causes release of platelets of varying sizes which is represented by the Platelet Distribution Width (PDW) [Figure 1]. MPV reflects platelet turnover and activation, while PDW indicates variability in platelet size associated with activation or destruction.[3] Total circulating platelet mass is measured by Plateletcrit (PCT). An increase in platelet count, MPV and PCT suggests recovery phase in viral illness like dengue and similarly a decrease in platelet count, MPV and PCT suggests excessive platelet utilization and/or destruction. The degree of thrombocytopenia predicts the severity of the illness, associated complications and prognosis.[4,6] These indices may help identify early progression toward severe disease. Disease expression varies with demographic factors. Children and older adults are more prone to severe dengue manifestations. This highlights the value of combining platelet indices with demographic variables for early prediction of complications such as DHF.[7] This study aims to evaluate the platelet parameters with degree of thrombocytopenia and to determine their relationship with demographic variables like age and gender and to predict the potential for hemorrhagic manifestations in dengue patients.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Pathology and Microbiology at a tertiary care center between May 2023 and August 2023. The study protocol was reviewed and approved by the Institutional Ethical Committee [BGS GIMS IEC/APP/MAR/03/23-24]. Patients presenting with acute febrile illness and clinical features suggestive of dengue, such as headache, retro-orbital pain, myalgia, arthralgia, rash, and bleeding manifestations, were evaluated for eligibility. A total of 240 patients with dengue-like symptoms were screened after obtaining informed consent. Diagnostic confirmation of dengue infection was performed using a rapid immunochromatographic card test. The dengue NS1 antigen was tested during the acute phase of illness along with dengue-specific IgM and IgG antibodies tests. A case was classified as dengue positive if either NS1 antigen or dengue IgM was reactive in accordance with WHO guidelines. Out of the 240 patients evaluated, 129 were confirmed to be dengue positive and formed the study cohort for subsequent analysis. Patients with pre-existing hematological disorders, anticoagulant(s) therapy and inconclusive results were excluded from the study.

Data Collection: Demographic details, including age and gender, along with clinical features, were recorded for all enrolled patients. Venous blood samples were collected in EDTA tubes and processed within two hours of collection. Hematological parameters, including platelet count, mean platelet volume (MPV), platelet distribution width (PDW) were measured using the ABX Micros 60 hematology analyzer.

Stratification: We stratified the data into different age groups and different platelet counts categories as below:

Age groups: 1–20, 21–40, 41–60, >60 years.

Platelet Counts categories: <20,000/µL, 20,000–50,000/µL, 50,000–100,000/µL, >100,000/µL

Statistical Analysis: Statistical analysis was performed using SPSS Software. Continuous variables were presented as mean ± SD. ANOVA and t-tests were applied to compare means, and Chi-square tests were used for categorical data. A p-value <0.05 was considered significant.

RESULTS

During the study period there were 240 patients of all age groups with dengue-like symptoms which included in-patients and out-patients, out of these 129 were found to be confirmed dengue seropositive cases.

Platelet count variations: Platelet count showed a significant mean difference between the different age groups. Platelet count was found to be lower in the older age group when compared to the younger and middle age groups. [Table 1]

There were fifteen patients (11.6%) with platelet count less than 20,000/µL, twenty-seven (20.9%) patients with platelet count between 20,000 to 50,000/µL, fifty-nine (45.7%) patients between 50,000 to 100,000/µL contributing largest amongst all the age groups and twenty-eight (21.7%) patients with platelet count more than 100,000/µL.

In the 1–20 year group with 33 patients, most patients (42%) had platelet counts between 50,000 and 100,000/µL. Eight patients (24%) had counts above 100,000/µL, while eleven (33%) patients had counts below 50,000/µL. This shows that thrombocytopenia

was frequent in this age group, with a wide distribution across severity categories.

In the 21–40 year group, nearly three quarters of patients had platelet counts of at least 50,000/µL. Twenty three (42.5%) had counts between 50,000 and 100,000/µL and seventeen (31.4%) had counts above 100,000/µL. Fourteen (25.9%) patients had counts below 50,000/µL. This group showed a tendency toward higher platelet counts compared with the youngest and oldest age groups.

In the 41–60 year group, nineteen of thirty-one (61.2%) patients had platelet counts between 50,000 and 100,000/µL. Only three (9.6%) had counts above 100,000/µL and nine (29%) had counts below 50,000/µL. This group showed moderate thrombocytopenia, with fewer patients in the mild thrombocytopenia category.

In the >60 year group, none of the eleven patients had platelet counts above 100,000/µL. Most of them had counts between 20,000 and 50,000/µL six out of eleven (54.5%). Two (18.1%) patients had counts below 20,000/µL and three (27.2%) had counts between 50,000 and 100,000/µL. This group showed majority of the cases in severe thrombocytopenia category. [Table 2].

Subjects in the age group 1 to 20 years showed a mean platelet count of 69272.73 ± 35431.51 and 75079.63 ± 38440.53 in 21 to 40 years while it was 33181.82 ± 18115.29 in subjects with greater than 60 years. The post hoc test revealed a significant difference in the mean platelet count between the subjects in the age group of 1 to 20 and >60 years (p =0.01) and between subjects aged 21 to 40 and >60 years (p =0.002). [Table 3]

Among males, most patients had platelet counts between 50,000 and 100,000/µL thirty-nine of eighty-six (45.3%) . Eighteen (20.9%) had counts above 100,000/µL and twenty-nine (33.7%) had counts below 50,000/µL. Among females, twenty of forty-three (46.5%) patients had platelet counts between 50,000 and 100,000/µL. Ten (23.2%) had counts above 100,000/µL and thirteen (30.2%) had counts below 50,000/µL. Mean platelet counts were 67,108.14 ± 35,982.66/µL in males and 67,348.84 ± 35,577.47/µL in females. The independent t test showed no statistically significant difference in mean platelet count between males and females (p = 0.97). This indicates that gender did not influence platelet count distribution in this sample. [Table 4]

PDW and MPV Variations:

PDW showed a gradual numerical increase across age groups, from 11.64± 2.90 fL in the youngest group to 12.95± 2.90 fL in the oldest group. MPV values showed small fluctuations, with slightly higher values in the 21–40 year group. Despite these numerical differences, statistical analysis showed no significant variation in PDW (p = 0.43) or MPV (p = 0.11) among age groups. Age therefore did not show a significant association with PDW or MPV in this study. [Table 5]

Males showed slightly higher mean PDW and MPV values compared with females, but the ranges overlapped widely. The p values for PDW (p = 0.25) and MPV (p = 0.63) indicated no statistically significant differences between genders. PDW and MPV were therefore similar in males and females in this cohort.

Plateletcrit analysis: Plateletcrit showed a statistically significant difference in the mean plateletcrit among the different age groups (p =0.002). The mean plateletcrit was higher among 21 to 40 years that is in fifty-four (41.8%) of total patients count (0.066 ± 0.037) and it was lower in subjects greater than 60 years that is eleven (8.5%) of total patients count (0.031± 0.019). The post hoc test revealed a significant difference in the mean plateletcrit between the subjects in the age group of 1 to 20 and >60 years (p = 0.03) and between subjects aged 21 to 40 and >60 years (p =0.002). [Table 6,7]

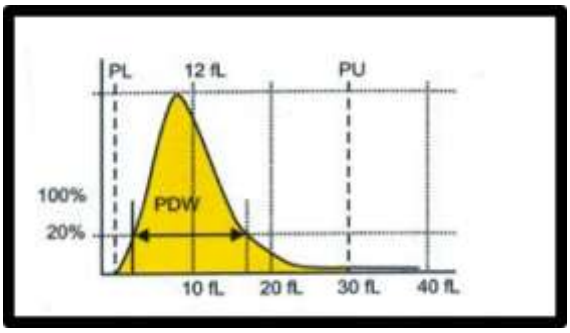

Figure 1: Normal Platelet Distribution Width (PDW)

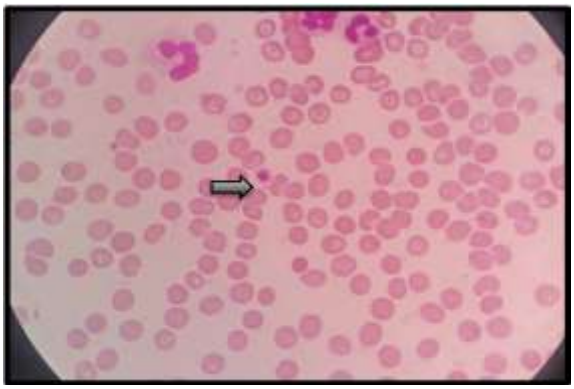

Figure 2: Peripheral smear image from a case with low platelet count: the platelets are reduced in number with few large platelet (arrow mark)

Table 1: Age vs Platelet Counts

Age Group (years) vs platelet count	<20,000	20,000–50,000	50,000-100,000	>100,000	Total
1–20	3 (9%)	8 (24.2%)	14 (42.4%)	8 (24.2%)	33 (25.5%)
21–40	7 (12.9%)	7 (12.9%)	23 (42.5%)	17 (31.4%)	54 (41.8%)
41–60	3 (9.6%)	6 (19.3%)	19 (61.2%)	3 (9.6%)	31 (24%)
>60	2 (18.1%)	6 (54.5%)	3 (27.2%)	0	11 (8.5%)
Total	15 (11.6%)	27 (20.9%)	59 (45.7%)	28 (21.7%)	129

Table 2: Age vs Means Platelet Count

Age Group (years)	Mean Platelet count ± SD
1–20	69272.73 ± 35431.51
21–40	75079.63 ± 38440.53
>60	33181.82 ± 18115.29

Table 3: Gender vs Platelet Counts

Gender	<20,000	20,000-50,000	50,000-100,000	>100,000	Total
Male	10 (11.6%)	19 (22%)	39 (45.3%)	18 (20.9%)	86
Female	5 (11.6%)	8 (18.6%)	20 (46.5%)	10 (23.25%)	43

Table 4: PDW and MPV variations for age

Age Group (years)	PDW (Mean ± SD)	MPV (Mean ± SD)	Total
1–20	11.64 ± 2.90 fL	9.75 ± 1.69 fm3	33
21–40	12.34 ± 3.67 fL	10.12 ± 1.37 fm3	54
41–60	12.85 ± 2.68 fL	9.43 ± 1.05 fm3	31
>60	12.95 ± 2.69 fL	9.44 ± 0.85 fm3	11
p value	0.43	0.11	

Table 5: PDW and MPV variations for gender

Gender	PDW (Mean ± SD)	MPV (Mean ± SD)	Total
Male	12.56 ± 2.96 fL	9.84 ± 1.49 fm^3	86
Female	11.88 ± 3.58 fL	9.72 ± 1.14 fm^3	43
p value	0.25	0.63	

Table 6: Descriptive statistics of Plateletcrit

Min	Max	Mean	Median	Std Dev	95% CI for Mean	
					Lower Bound	Upper Bound
0.010	0.190	0.066	0.060	0.038	0.060	0.073

Table 7: Comparison of mean PCT based on age and gender.

		N	Mean ± SD	p value
Gender	Male	86	0.066 ± 0.038	0.81
	Female	43	0.065 ± 0.035	
Age in years	1 -20	33	0.066 ± 0.037	0.002
	21 - 40	54	0.076 ± 0.041	
	41 - 60	31	0.060 ± 0.027	
	>60	11	0.031 ± 0.019	

DISCUSSION

This study evaluated platelet count, MPV, PDW and plateletcrit in laboratory-confirmed dengue patients across different age and gender groups. The findings show that platelet count and plateletcrit demonstrated a clear and statistically significant variation with age, while MPV and PDW did not show meaningful diagnostic or prognostic differences. Gender did not influence any of the platelet parameters. Each of these findings aligns with patterns documented in the existing literature included in the reference list.

The most prominent observation was the clear age-related decline in platelet count. Older individuals showed the lowest mean platelet values and the highest proportion of platelet counts below 50,000 per microliter. Jayashree et al. reported similar trends in their study, stating that platelet count is one of the most consistent markers of dengue severity and shows clear differences across patient risk groups.[3] Their work highlighted the value of platelet count in categorizing patients and predicting severity. The present findings closely follow that pattern. Asha et al. also demonstrated the strong clinical relevance of platelet count and plateletcrit in dengue. In their study on platelet indices and transfusion practices, they observed that platelet count and plateletcrit remained the most dependable value for monitoring disease progression and making clinical decisions..[8] Their results supported using platelet count as a primary parameter, especially when resources are limited. The platelet distribution seen in older adults in the present study agrees with this evidence and reinforces the importance of monitoring platelet decline in elderly dengue patients.

Younger patients also showed substantial thrombocytopenia, although with a wider spread across platelet categories. This pattern reflects the well-documented hematologic characteristics of dengue infection described in the WHO guidelines, which identify thrombocytopenia as a defining feature of dengue across all age groups.[9,10] Kalayanarooj observed similar findings in her analysis of dengue cases, showing that platelet decline occurs consistently across different clinical presentations and is not restricted to severe cases alone.[2] The distribution of platelet counts in the younger age groups in this study is consistent with both sources.

Gender did not influence platelet count or plateletcrit patterns in this study. Male and female patients showed a similar distribution across all platelet

categories. Salazar Flórez et al. reported comparable results in their evaluation of dengue in a hyper endemic region, where they noted that both genders exhibited similar clinical profiles and hematologic findings, including platelet behavior.[7] The present study supports this observation and confirms that gender does not affect platelet trends in dengue. MPV and PDW did not show significant associations with age or gender in this dataset. The numerical variations seen across groups did not reach statistical significance, indicating that these indices did not show consistent diagnostic behaviour. Khatri et al. reported similar findings and noted that MPV and PDW varied widely among serologically confirmed dengue patients but did not consistently correspond with the degree of thrombocytopenia or severity.[11] Menon et al. also concluded that these indices did not correlate reliably with platelet count or clinical stage, citing wide intra-group variation in MPV and PDW values.[12] Kumar et al. supported this view by demonstrating that MPV and PDW did not show uniform changes across dengue risk categories and were therefore not dependable standalone markers.[13] The current results align with these findings and demonstrate similar variability.

Some studies included in the reference list proposed potential roles for MPV and PDW in dengue assessment. Sharma et al. observed that MPV may rise in some dengue presentations and explored its possible association with severity.[14] However, the present study did not reproduce these findings.

Senthil Nathan et al. explained that platelet indices are influenced by equipment variability, measurement conditions, and biological fluctuations, which may explain why MPV and PDW do not always behave consistently across studies.[15] These factors may also contribute to the lack of significant patterns seen in the present dataset.

Limitations: It is important to note that our findings regarding the non-utility of MPV and PDW contradict some previous literature. This discrepancy may be due to differences in study population, laboratory analyzers, or timing of sample collection, highlighting the need for standardized, multi-center research. Our data is limited to one outbreak season and lack long-term follow-up. Future research involving multicenter trials with larger sample sizes and longer follow-up is recommended to validate and refine predictive thresholds.

CONCLUSION

Our study showed that younger individuals and older adults were more likely to present with significant thrombocytopenia during dengue infection. Monitoring platelet count in these high-risk age groups remains a central part of clinical evaluation. MPV and PDW did not demonstrate clear diagnostic or prognostic value in this sample. Plateletcrit was also found to be an important indicator in assessing the severity among different age groups. Based on these findings, routine use of MPV or PDW as predictors of disease outcome is not recommended. Platelet count remains the most consistent parameter for assessing dengue-related thrombocytopenia.

REFERENCES

1. World Health Organization[Internet]. WHO; 2023. Dengue-Global situation. Available from: https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON498
2. Kalayanarooj S. Clinical Manifestations and Management of Dengue /DHF/DSS. Tropical medicine and health. 2011 Dec;39(4 Suppl):83–7.
3. Jayashree K, Manasa GC, Pallavi P, Manjunath GV. Evaluation of platelets as predictive parameters in dengue Fever. Indian journal of hematology & blood transfusion : an official journal of Indian Society of Hematology and Blood Transfusion. 2011 Sep;27(3):127–30.
4. Sontakke RA, Aglave NR, Dua H. Correlation of Platelet Parameters with the Severity of thrombocytopenia in Dengue fever in Children less than 18 years at a Tertiary Care Centre: A Cross-Sectional Study. Cureus 16(3): e56829. DOI 10.7759/cureus.56829
5. Maluf CB, Baretto SM, Vidigal PG: Standardization and reference intervals of platelet volume indices: insight from the Brazilian longitudinal study of adult health(ELSA-BRASIL). Platelets. 2015,26:413-20. DOI:10.3109/09537104.2014.942620
6. Indumathi S, Anoosha K, Lakshmi V: Assessment of platelet indices as prognostic markers in seropositive cases of dengue. J Med Sci Clin Res. 2019, 7:322-6. 10.18535/jmscr/v7i9.56
7. Salazar Flórez JE, Marín Velasquez K, Segura Cardona ÁM, Restrepo Jaramillo BN, Ortega Díaz YE, Giraldo Cardona LS, et al. Clinical Manifestations of Dengue in Children and Adults in a Hyperendemic Region of Colombia. The American journal of tropical medicine and hygiene. 2024 Mar 19;110(5):971–8.
8. Asha J, Baiju NM, Innah SJ, Rafi A, John BM. Comparison of platelet indices in dengue fever Patients based on platelet transfusion. Asian Journal of Transfusion Science. 2023 Jan;17(1):21–7.
9. Control of Neglected Tropical Diseases (NTD). Dengue guidelines, for diagnosis, treatment, prevention and control. World Health Organization [Internet]. 2009 Apr 21; Available from: https://www.who.int/publications/i/item/9789241547871
10. World Health Organization. Dengue: guidelines for diagnosis, treatment, prevention and control. New edition. Geneva: World Health Organization; 2009. Available from: https://www.who.int/publications/i/item/9789241547871
11. Khatri S, Sabeena S, Arunkumar G, Mathew M. Utility of Platelet Parameters in Serologically Proven Dengue Cases with Thrombocytopenia. Indian Journal of Hematology and Blood Transfusion. 2018 Jan 23;34(4):703–6.
12. Menon D, Sekhar G, R SA, M S. Analysis of Platelet Indices and its correlation with platelet count In Dengue. International Journal of Research in Pharmaceutical Sciences. 2020 Apr 25;11((SPL 2)):284–9.
13. Kumar N, Swamy M, Chakraborti S, Kini J, Singh T, Sahay B, et al. Correlation of mean platelet volume and platelet distribution width in risk categories of dengue fever- a pilot STUDY. Journal of Evolution of Medical and Dental Sciences. 2018 Jan 8;7(02):142–5.
14. Sharma K, Yadav A. Association of Mean Platelet Volume with Severity, Serology & Treatment Outcome in Dengue Fever: Prognostic Utility. Journal of clinical and diagnostic research : JCDR. 2015 Nov;9(11):EC01-3.
15. Senthil Nathan S, Varadaraj P, Nallusamy G, Reddy KSS. The Significance of Platelet Indices in the Evaluation of Thrombocytopenia. Cureus. 2024 Jul 30;16(7):e65756.