(International Print/Online Journal)

SJIF IMPACT FACTOR: 6.829
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 9, Issue 3, Page No: 296-304
May-June 2026

IJMSCR

A Comprehensive Assessment Of Platelet And Red Cell Indices In Dengue Versus Non-Dengue Infections

Ardra Narayanan[1*], Dr. Omkareshwar Patil[2], Yashaswi A N[1],
[1]M.Sc. MLT, [2]Associate Professor,
Department of Pathology,
Father Muller College of Allied Health Sciences, Mangalore, Karnataka, India

***Corresponding Author:**
Ardra Narayanan
M.Sc. MLT, Department of Pathology,
Father Muller College of Allied Health Sciences, Mangalore, Karnataka, India

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract

Background: Dengue fever is a most rapidly spreading mosquito-borne viral infections worldwide, posing a major public health challenge, particularly in tropical and subtropical regions. Early diagnosis plays a crucial role in reducing morbidity and mortality. Hematological parameters, especially red cell indices and platelet indices, have emerged as potential early markers in the diagnosis and prognosis of dengue infection.

Methods: This descriptive cross-sectional study was conducted in the hematology and microbiology laboratories of father muller medical college hospital. Overall 200 participants were included, comprising 100 dengue-positive cases and 100 non-dengue controls. Serological testing for dengue was performed using rapid diagnostic method. Hematological parameters including platelet and red cell indices data were collected. Clinical and demographic data were obtained from the hospital information system.

Results: The study showed male predominance in both groups. NS1 antigen positivity was the most common serological finding, indicating early infection. Dengue patients had significantly lower platelet counts and plateletcrit (PCT), with increased platelet distribution width (PDW) and mean platelet volume (MPV). No significant differences were observed in hematocrit and red cell indices. Fever was the most common symptom, followed by body pain, headache, myalgia, and fatigue.

Conclusions: The study concludes that thrombocytopenia and changes in platelet indices, particularly increased MPV and PDW and decreased PCT, are significant hematological markers in dengue infection. In contrast, red cell indices and hematocrit did not show significant differences between dengue and non-dengue cases. Early recognition of these hematological changes can aid in timely management and improved clinical outcomes in dengue patients.

Keywords: dengue, red cell indices, mean corpuscular volume, mean corpuscular hemoglobin, mean platelet volume, platelet

Introduction

Dengue fever (DENV) is the disease that spreads through mosquitoes the fastest in the globe. Every year, over 50 million people in about 100 countries contract dengue fever.(1)Dengue, a Spanish variant of the Swahili term Kidinga pepo, is the common virus that infects people. From a low-grade fever to a potentially fatal shock syndrome, an infection might be asymptomatic or show a wide variety of clinical symptoms(2)

Early detection of hematological abnormalities, such as red cell indices and platelet size, which are

generally observed signs of severe dengue infection, could possibly be able to predict a range of clinical consequences(3). Diagnosing dengue early is important to offer specific care that significantly lowers the disease's morbidity(4).In 1929, Wintrobe intended the words mean cell volume (MCV), mean cell hemoglobin (MCH) and mean cell hemoglobin concentration (MCHC) to describe the size and hemoglobin content of red blood cells. If hemoglobin, hematocrit (PCV) and red blood cell count are analyzed, red cell indices can be computed(5).For a number of years, platelet parameters, such as the plateletcrit (PCT), platelet distribution width (PDW), and mean platelet volume (MPV), have been available in the laboratory routine using blood cell counters.(6) Modern hematology analyzers that measure platelet indices (PIs) by using optical light scatter counting or impedance counting techniques.(7)In the determination and prognostication of dengue fever, platelet indices (PI) may serve as predictive instruments. By the fourth or fifth day of their illness, dengue patients may exhibit thrombocytopenia.(8)

Hematological markers that aid in the identification and prompt treatment of dengue infections include HCT, MCV, MCH, RDW, MPV, the PDW(9) So the study aimed to evaluate the role of red cell indices and platelet indices in dengue infection.

Materials And Methods:

Source Of Data, Study Setting

The study was carried out in the hematology and microbiology section of the central laboratory. Participants were selected based on their dengue status, and both patients who tested positive and those who tested negative for the virus were included in the investigation. The study was conducted in father muller college hospital laboratory.

Study Design

This was a Retrospective, Cross-sectional and Descriptive study.

Sample Size Calculation

Formula

$$n = \frac{\left(2\, s_p^2 \left[Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right]^2\right)}{\mu_d^2}$$

$$s_p^2 = \frac{s_1^2 + s_2^2}{2}$$

Were,

S_1^2: Standard deviation in the first group

S_2^2: Standard deviation in the second group

μd^2: Mean difference between the samples

α: Significance level

$1 - \beta$: Power

Here, the standard deviation and mean values are obtained from the pilot study of 13 samples.

Standard deviation in group I- 0.97

Standard deviation in group II- 0.56

Mean difference- 0.33

Alpha error (%)- 5

Power (1- beta) %- 80

1 or 2 sided- 2

Minimum required sample size for each group - 90

The final sample size was rounded up to the nearest 100, resulting in total of 200 patients.(10)

Inclusion Criteria

All the seropositive and negative cases by dengue rapid test.

Exclusion Criteria

1. Patients with incomplete data.
2. Patients with malignancies
3. The dengue infected patients with co- infection.

Methods

This study was conducted as a descriptive cross-sectional study within the clinical settings of the hematology and microbiology laboratories at Father Muller Medical College Hospital, valuable information about the patients was collected. It comprises a total of 200 cases, participants were selected based on their dengue status, and both patients who tested positive and those who tested negative for the virus were included in the investigation.

To facilitate thorough analysis, venous blood samples were drawn and collected in EDTA tubes, which were used for evaluating hematological parameters

Volume 9, Issue 3; May-June 2026; Page No 296-304

including hemoglobin, hematocrit, platelet count, red cell indices such as MCV, MCH, MCHC and RDW, and platelet indices such as PCT, MPV and PDW in the hematology laboratory using the SYSMEX XN-1000 autoanalyzer, and the data were recorded. Blood samples were also collected in plain tubes for the serological detection of dengue, and rapid testing was performed in the microbiology laboratory, after which the data were recorded. Additionally, all relevant demographic, clinical, and diagnostic data of the patients were obtained from the Hospital Information System (HIS).

Statistical Analysis-

1. To describe the data frequency, percentages, and mean, standard deviation (SD) is used.
2. To investigate changes in the indices in case and control group independent sample 't' test will be used.
3. Pie chart and bar graphs were used for graphical representation.
4. p value $\leq$ 0.05 is considered statistically significant.

Results

The present study comprises a total of 200 cases, out of which 100 were dengue positive cases and 100 negative cases as control group were included in the study.

The study involves 100 dengue patients and 100 non-dengue control group; the majority of participants were male in both groups. Specifically,69 patients were male and 31were female in dengue patients, while in non-dengue, group 64 were male and 36 were female. This indicates a distinct male predominance in the patients with dengue. (Table 1)

The age group 1-20 years comprised of 9 males and 3 females, 21-40 years had 25 males and 11 females, 41-60 years had 24 males and 10 females, 61-80 years had 10 males and 7 females and >81 years had 1 male. So, it indicates that majority of patients were in 21-40 years age group.

In case of distribution of serum markers in dengue infection, 71 patients were NS1 positive, 15 patients were Ig M positive, 12 patients were both NS1 and Ig M positive and 2 patients were Ig M and Ig G positive. (figure 1)

Patients with dengue had a significantly lower platelet count than those without the illness. This difference was statistically highly significant ($p < 0.001$), indicating a marked reduction in platelet levels among dengue patients compared to non-dengue patients. (figure 2)

Dengue patients had a significantly higher Platelet Distribution Width (PDW) than non-dengue patients and it was statistically significant (figure 3)

Patients with dengue had a significantly higher Mean Platelet Volume (MPV) than patients without the disease, suggesting increased platelet size among dengue patients compared to non-dengue patients. (figure 4)

Patients with dengue had a considerably lower plateletcrit (PCT) than those without the disease. (figure 5)

There was no statistically significant difference in hematocrit (HCT) levels between dengue and non-dengue patients. The two groups' hematocrit levels were similar, as evidenced by the fact that the difference between them was not statistically significant. (figure 6)

There were no statistically significant variations in the red blood cell indices of dengue and non-dengue patients.

Fever was the most common clinical sign in 88 instances. fatigue (25), headache (30), myalgia (26), and physical discomfort (35) were additional frequently reported complaints. (table 2)

Discussion

An estimated 390 million cases of dengue fever, a virus spread by mosquitoes, are recorded annually in tropical and subtropical areas, making it a major public health concern. To lower the risk of morbidity and mortality from dengue, it is critical to identify the clinical and laboratory factors linked to severe dengue as soon as feasible.(4)

The age group of 21 to 40 years old had the largest percentage of patients in study conducted by Thapa TB et al, especially among females (70%), with males making up 45% of the same age group. With very few patients above 60, the contributions from the other age categories were comparatively smaller. Similarly, our study showed that the majority of patients were in the 21–40 age range, with the 41–60 age group coming in

Volume 9, Issue 3; May-June 2026; Page No 296-304

second. But in contrast to the study by Thapa TB et al, our study consistently revealed more male patients in nearly every age category. Although gender distribution and relative proportions across various age groups varied across the two datasets, both findings show that young to middle-aged individuals (21–40 years) represent the most affected demographic overall.(9)

In the comparison between our study and the study done by Rai A et al, the distribution pattern of the two studies' serological indicators is strikingly similar, with NS1 antigen positive being the most common finding. The majority of patients in both studies presented during the early acute phase of dengue infection, with NS1 alone accounting for 71% of cases in our study (n=100) and 72.3% of cases in the study done by Rai A et al (n=2022). A similar timing of case detection was further supported by the fact that the proportion of NS1 associated with IgM was similar

across the two investigations (12% vs. 11.9%). However, compared to the study by Rai A et al. (9%), our study's IgM positive alone was higher (15%), suggesting a higher proportion of those in the mid-acute phase. Additionally, compared to our study (2%), signs of secondary infection (IgG involvement) were more prevalent in his study (about 6.8% when combining IgG-associated categories). Despite minor variations in the distribution of IgM and IgG, both studies demonstrate a prevalence of early dengue infection at the time of diagnosis, highlighting the value of NS1 antigen identification as a key diagnostic marker in acute patients.(11)

Dengue patients had significantly lower platelet counts in the current study. The difference between the dengue and non-dengue groups was determined to be statistically significant ($p < 0.001$). These results show that thrombocytopenia is highly prevalent in dengue cases. In the same way, Rai's study revealed a mean platelet count of 135.50 with a standard deviation of 78.13, which was statistically significant ($p < 0.001$). Both studies show a definite decline in platelet counts among dengue patients, although using different statistical techniques. When everything is taken together, both results clearly confirm that a lower platelet count is a noteworthy hematological characteristic of dengue infection and can be a crucial laboratory indicator in its clinical assessment.(11)

Dengue patients had higher Mean Platelet Volume (MPV) than non-dengue patients in the current study. This difference was statistically significant ($p < 0.001$), indicating that dengue infection is associated with an increase in MPV. In a similar vein, Sharma S.K.'s study revealed an MPV value of 9.53, with 1.7% of cases exhibiting high MPV, and the correlation was statistically significant ($p < 0.05$). Despite the fact that the parameters were expressed differently in the two studies, the results indicate that MPV tends to be elevated in dengue patients and shows a significant correlation with the disease. The increase in MPV may be due to increased platelet disintegration and the bone marrow's compensatory release of larger, immature platelets.(8)

The current investigation demonstrated significant differences in PCT levels between dengue and non-dengue patients. The median PCT level for dengue patients was 0.11 ng/mL (IQR: 0.05–0.135), whereas the median value for the non-dengue group was higher at 0.24 ng/mL (IQR: 0.20–0.29). There was a statistically significant difference ($p < 0.001$). These findings suggest that PCT levels tend to remain relatively low in dengue infection, in contrast to other febrile conditions. Similar results were found in a study by Rai et al, which showed a statistically significant connection ($p = 0.004$) and a mean PCT level of 0.17 ± 0.09 ng/mL. Even so, their study's mean PCT value is in the middle of the median values for the dengue and non-dengue groups in the current study.(11)

The Platelet Distribution Width (PDW) of dengue and non-dengue patients differed significantly in the current study. The statistical significance of this difference was determined to be $p < 0.001$. Greater variance in platelet size is indicated by the higher PDW seen in dengue patients, which may be a reflection of enhanced platelet activation and destruction linked to dengue infection. It is well known that dengue virus infection suppresses bone marrow and destroys peripheral platelets, releasing platelets of different sizes into the bloodstream. These results lend validity to PDW's potential use as an extra laboratory marker to help doctors diagnose and treat dengue infections early.

Hematocrit (HCT) values were examined between dengue and non-dengue groups in the current study. Hematocrit levels were similar between dengue and

Volume 9, Issue 3; May-June 2026; Page No 296-304

non-dengue patients in this study population, according to statistical analysis, which showed no significant difference between the two groups (p = 0.528). Hematocrit levels were elevated in 117 people, normal in 1375 participants, and decreased in 530 persons based on the study done by Rai A et al. The majority of participants had normal hematocrit levels, indicating that considerable hemoconcentration or hematocrit loss was comparatively less common in the study population as a whole.(11)

Red blood cell indices (MCV, MCH, MCHC, and RDW) were examined between dengue and non-dengue groups in this study. There were no statistically significant variations between the median values of MCV, MCH, MCHC, and RDW. The majority of participants exhibited normal values for the following indices, according to the study conducted by Rai. Increased values were comparatively rare, but decreased values were observed in 555 for MCV, 480 for MCH, and 202 for MCHC. RDW revealed elevated values in 684 participants and normal values in 1345.(11)

Conclusion

The study concludes that thrombocytopenia and changes in platelet indices, particularly increased MPV and PDW and decreased PCT, are significant hematological markers in dengue infection. In contrast, red cell indices and hematocrit did not show significant differences between dengue and non-dengue cases. Fever was the most common clinical sign in 88 instances. fatigue (25), headache (30), myalgia (26), and physical discomfort (35) where additional frequently reported complaints Early recognition of these hematological changes can aid in timely management and improved clinical outcomes in dengue patients.

References

1. Ab B, Ok S, Ba M, Ak A. Role of Platelet Indices in Patients with Dengue Infection in Red Sea State, Sudan. International Journal of Science and Research (IJSR) ISSN [Internet]. 2013. Available from: www.ijsr.net
2. Patel KB, Ranapurwala MF, Patel A. Utility of Red Cell and Platelet Indices Evaluation of Severity of Dengue Infection. Annals of Pathology and Laboratory Medicine. 2022 Jun;9:A83-88. doi:10.21276/apalm.3156
3. Nandwani S, Bhakhri BK, Singh N, Rai R, Singh DK. Early hematological parameters as predictors for outcomes in children with dengue in Northern India: A retrospective analysis. Rev Soc Bras Med Trop. 2021;54:1–7. doi:10.1590/0037-8682-0519-2020 PubMed PMID: 33533817.
4. Jameel T, Mehmood K, Mujtaba G, Choudhry N, Afzal N, Paul RF. Changing haematological parameters in dengue viral infections. J Ayub Med Coll Abbottabad. 2012;24:3–6. PubMed PMID: 23855082.
5. PR S. Red Cell Indices.. Clinical Methods: The History, Physical, and Laboratory Examinations. Clinical Methods: The History, Physical, and Laboratory Examinations. 1990;3rd editio. PubMed PMID: 21250103.
6. Giovanetti TV, do Nascimento AJ, de Paula JP. Platelet indices: Laboratory and clinical applications. Revista Brasileira de Hematologia e Hemoterapia. 2011. p. 164–5. doi:10.5581/1516-8484.20110040
7. Budak YU, Polat M, Huysal K. The use of platelet indices, plateletcrit, mean platelet volume and platelet distribution width in emergency non-traumatic abdominal surgery: A systematic review. Biochemia Medica. Biochemia Medica, Editorial Office; 2016. p. 178–93. doi:10.11613/BM.2016.020 PubMed PMID: 27346963.
8. Kumar Sharma S, Rathore M. Section: Pathology Original Article Evaluation of Haematological Parameters in Dengue Patients.
9. Thapa TB, Bhattarai BR, Maharjan S, Pokhrel S, Sapkota M. Insights of hematological parameters in dengue virus-infected patients. Indian Journal of Pathology and Oncology. 2023 Dec;10:340–5. doi:10.18231/j.ijpo.2023.077
10. M. K. M, Khan SA, Saldanha P. Clinical study of anemia in rural school children of Mangalore, Karnataka, India. Int J Contemp Pediatrics. 2019 Feb;6:416. doi:10.18203/2349-3291.ijcp20190051
11. Rai DrA, Azad DrS, Nautiyal DrS, Acharya DrS. Correlation between hematological and serological parameters in dengue patients- an analysis of 2022 cases. Tropical Journal of Pathology and Microbiology. 2019 Aug;5:547–54. doi:10.17511/jopm.2019.i08.07.

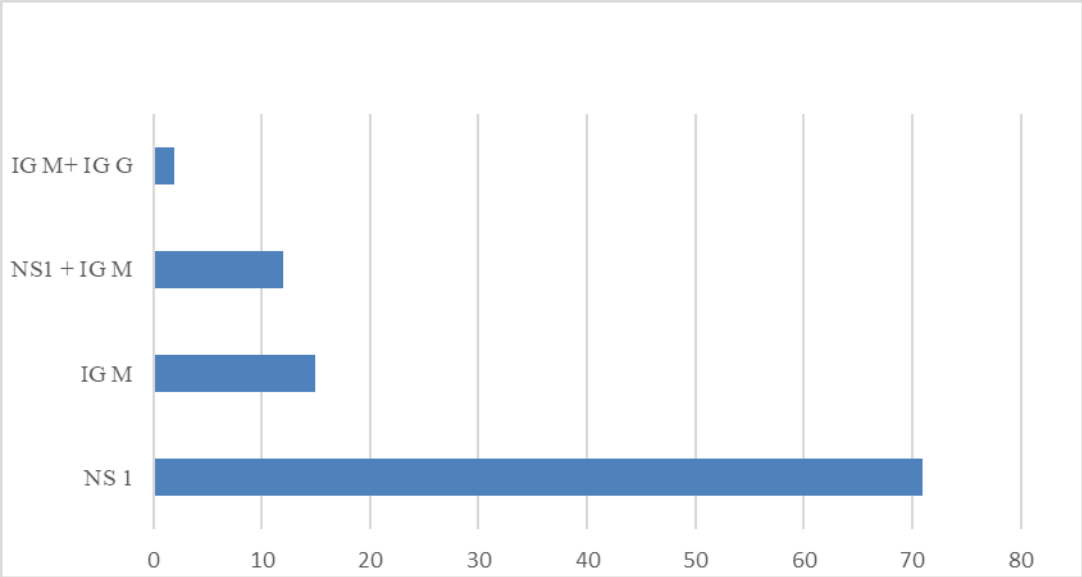
Volume 9, Issue 3; May-June 2026; Page No 296-304

Tables And Figures

Table 1: Gender Wise Distribution Of Patients With Dengue And Non-Dengue.

Group		Frequency	Percent	Valid Percent	Cumulative Percent
DENGUE	F	31	31.0	31.0	31.0
	M	69	69.0	69.0	100.0
	Total	100	100.0	100.0	
NON-DENGUE	F	36	36.0	36.0	36.0
	M	64	64.0	64.0	100.0
	Total	100	100.0	100.0	

Figure 1: Distribution Of Serum Markers.



Volume 9, Issue 3; May-June 2026; Page No 296-304

Figure 2: Platelets In Dengue And Non-Dengue Infection

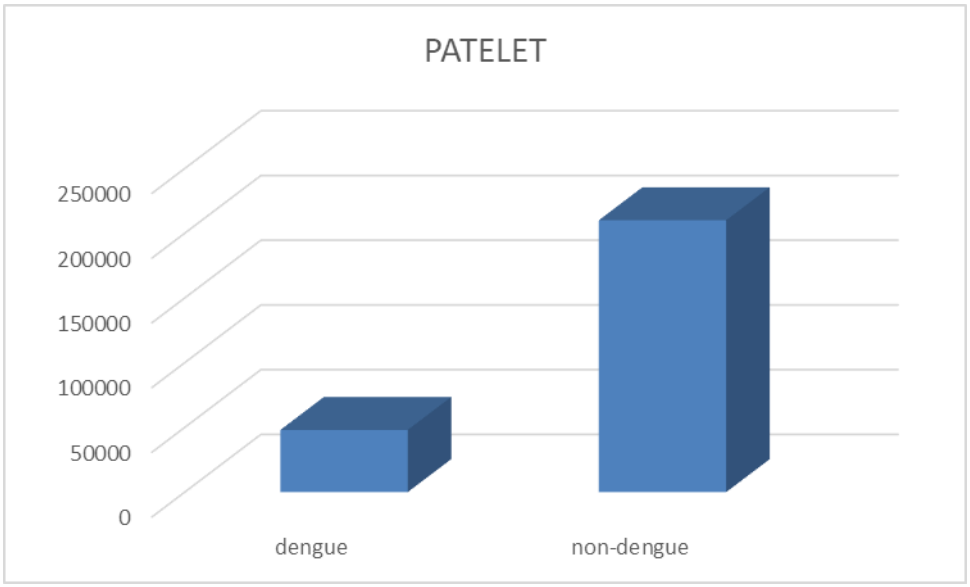
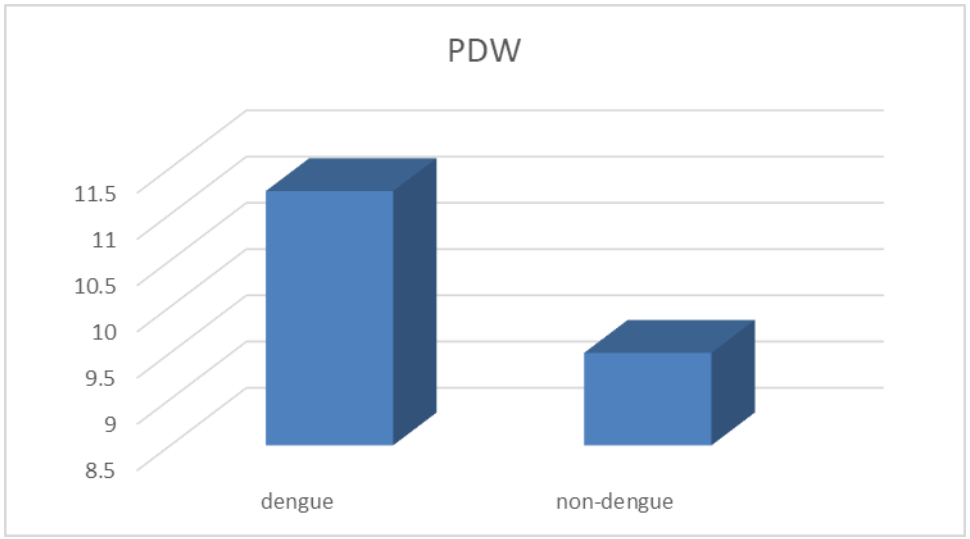


Figure 3: PDW In Dengue And Non-Dengue Infection



Volume 9, Issue 3; May-June 2026; Page No 296-304

Figure 4: MPV In Dengue And Non-Dengue Infection

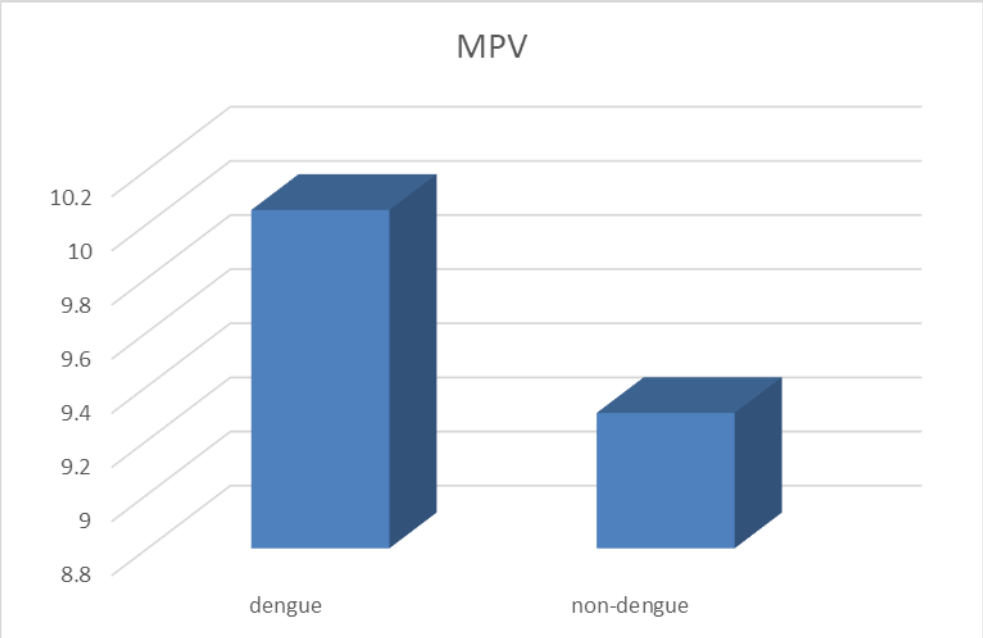
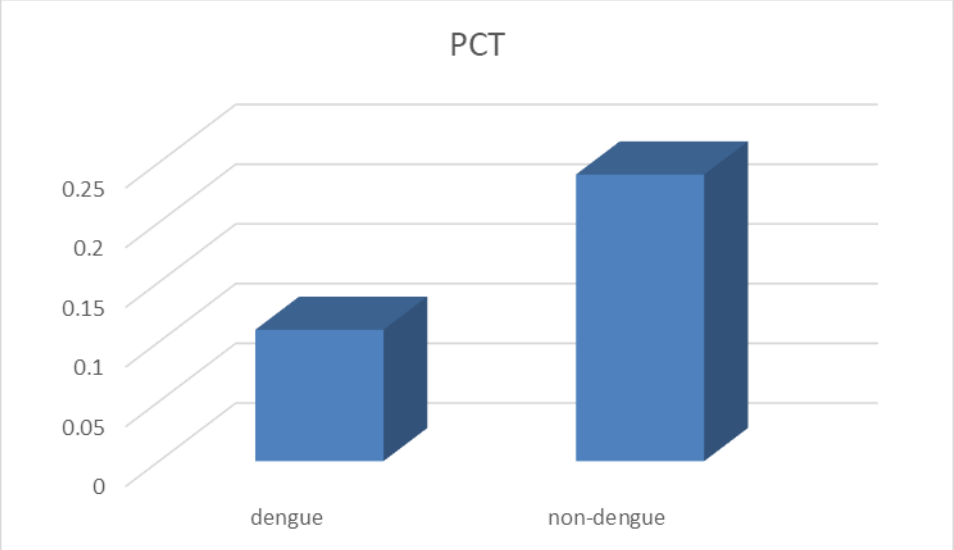


Figure 5: PCT In Dengue And Non-Dengue Patients



Volume 9, Issue 3; May-June 2026; Page No 296-304

Figure 6: HCT In Dengue And Non-Dengue Patients

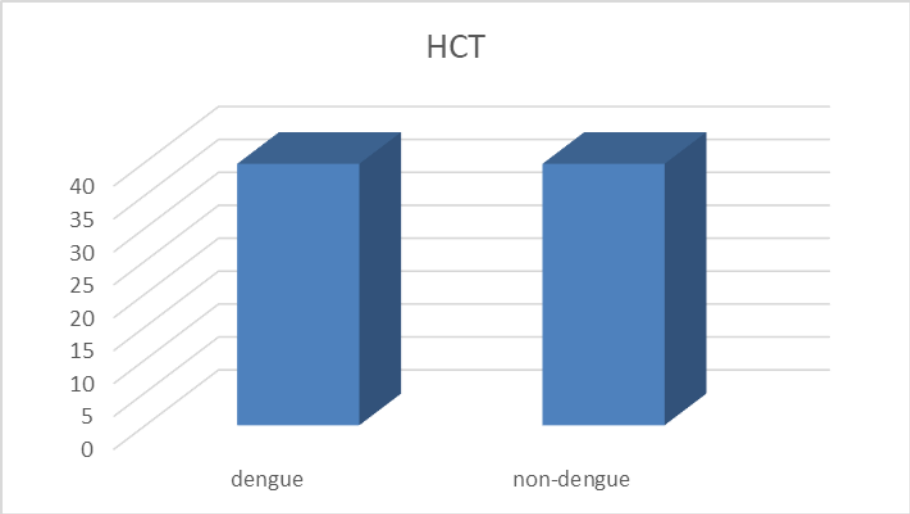


Table 2: clinical features of patients with dengue infection

CLINICAL FEATURES	FREQUENCY
Fever	88
Body pain	35
Headache	30
Myalgia	26
Fatigue	25
Vomiting	21
Nausea	13
Chills	16
Loss of appetite	16
Cough	13
Joint pain	8
Breathlessness	5
Cold	5
Constipation	3
Diarrhoea	2
Seizure	1

Volume 9, Issue 3; May-June 2026; Page No 296-304