



Original Article

## Study Of Dengue Patients with Dengue Fever for Its Association of Hypocalcemia and Disease Severity.

Dr. Yogananda M. N, Dr. Giri G. V, Dr. Raveendra Kodur, Dr. Rajesh S J

Victoria Hospital, Bangalore Medical College, Bangalore.

OPEN ACCESS

### Corresponding Author:

Dr. Sudipta Biswas  
[biswassudipta269@gmail.com](mailto:biswassudipta269@gmail.com)

Received: 02-02-2026

Accepted: 15-02-2026

Available online: 04-03-2026

### ABSTRACT

**Background:** Dengue is a major public health problem in endemic regions, with clinical presentations ranging from mild febrile illness to severe life-threatening syndromes. Biochemical abnormalities, particularly hypocalcemia, have been increasingly recognized as potential predictors of disease severity.

**Methods:** This observational study was conducted at Victoria Hospital, Bangalore Medical College, Bangalore, from July to December 2023. A total of 120 seropositive dengue patients aged  $\geq 18$  years were included after obtaining informed consent. Patients with other acute infections causing hypocalcemia or pre-existing calcium deficiency disorders were excluded. Demographic, clinical, and laboratory data were collected. Serum calcium levels were measured and patients were categorized as normocalcemic or hypocalcemic. Hypocalcemia was graded as mild, moderate, or severe. Disease severity was classified into dengue fever (DF), dengue hemorrhagic fever (DHF), and dengue shock syndrome (DSS) based on WHO criteria.

**Results:** Among 120 patients, the majority were aged 18–40 years (66.7%), with a male predominance (63.3%). DF was the most common presentation (70.0%), followed by DHF (23.3%) and DSS (6.7%). Hypocalcemia was detected in 36.7% of patients, with mild hypocalcemia being the most frequent (45.5%). A strong correlation was observed between calcium levels and disease severity: 71.4% of DF patients had normal calcium, compared to 50.0% in DHF and only 25.0% in DSS. Notably, 75.0% of DSS patients exhibited hypocalcemia. Thrombocytopenia was frequent, with most inpatients (82.4%) requiring platelet transfusions. The mean duration of hospital stay was longer in patients with hypocalcemia. Overall mortality was 3.3%, occurring exclusively in severe cases (DHF/DSS).

**Conclusion:** A significant proportion of dengue patients in our study exhibited hypocalcemia, which correlated strongly with disease severity. Monitoring serum calcium levels may provide a simple, cost-effective tool for early identification of patients at risk of severe disease. Early interventions could potentially reduce morbidity and mortality. Larger multicenter studies are warranted to validate these findings.

**Keywords:** Dengue, Hypocalcemia, Calcium, Dengue Hemorrhagic Fever, Dengue Shock Syndrome, Disease severity.

Copyright © International Journal of  
Medical and Pharmaceutical Research

### INTRODUCTION

Dengue fever is one of the most prevalent mosquito-borne viral infections in tropical and subtropical regions, with an estimated 390 million infections annually worldwide [1]. Clinical manifestations range from self-limiting febrile illness to severe, life-threatening forms such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). The pathophysiology of severe dengue involves plasma leakage, hemorrhage, organ impairment, and metabolic disturbances, including electrolyte abnormalities [2, 3].

Among these, hypocalcemia has recently gained attention as a potential biochemical marker of disease severity [4, 5]. Several studies have demonstrated a significant association between low serum calcium levels and progression to severe dengue syndromes. For instance, Constantine et al. reported that hypocalcemia was more common in patients with DHF compared to those with classical dengue fever, correlating strongly with adverse outcomes [6]. Similarly, Joshi et al. observed a high prevalence of hypocalcemia in dengue patients, with severity of calcium deficiency linked to clinical deterioration [7]. Hypocalcemia has been linked not only with disease severity but also with laboratory abnormalities such as thrombocytopenia and hemoconcentration [8].

Dengue fever continues to be a major public health challenge in India. While clinical parameters and hematological markers are commonly used to assess disease progression, there is growing evidence that biochemical abnormalities such as hypocalcemia may play a critical role in predicting disease severity. Early identification of hypocalcemia could therefore aid in risk stratification and timely intervention, potentially reducing complications and mortality. However, data on the prevalence and grading of hypocalcemia in adult dengue patients remain limited, particularly in the Indian context. In this study, we aimed (1) to identify hypocalcemia in patients with dengue infection, and (2) to correlate hypocalcemia with the severity of dengue fever classified as dengue fever (DF), dengue hemorrhagic fever (DHF), and dengue shock syndrome (DSS).

## MATERIALS AND METHODS

This hospital-based observational study was conducted at Victoria Hospital, Bangalore Medical College, Bangalore, over a six-month period from July 1, 2023 to December 31, 2023. A total of 120 patients who fulfilled the eligibility criteria were included in the study. Patients were enrolled after confirmation of seropositive dengue infection, either by NS1 antigen or IgM antibody positivity. Only individuals aged 18 years and above, who were willing to provide written informed consent, were recruited. Patients with a past history of non-dengue viral infection, those suffering from other acute infections known to cause hypocalcemia (such as malaria or leptospirosis), and those with pre-existing calcium deficiency disorders were excluded from the study to avoid confounding effects.

The study protocol was reviewed and approved by the Institutional Ethics Committee of Bangalore Medical College and Research Institute prior to commencement. Written informed consent was obtained from all participants before enrollment, in accordance with the principles of the Declaration of Helsinki. All patients were clinically evaluated and relevant demographic, clinical, and laboratory details were recorded systematically. Disease severity was classified into dengue fever (DF), dengue hemorrhagic fever (DHF), and dengue shock syndrome (DSS) based on WHO guidelines. Serum calcium levels were estimated, and cases were categorized as normal or hypocalcemic. Hypocalcemia was further graded into mild, moderate, or severe, according to serum calcium values. Additional parameters such as platelet counts, need for transfusion, duration of hospital stay, and mortality outcomes were also documented.

## RESULTS

Among the 120 patients included in the study, the majority were in the 18–40 years age group (66.7%), followed by 40–60 years (30.0%), while only 3.3% were older than 60 years. Males constituted a larger proportion (63.3%) compared to females (36.7%). With respect to patient type, most were outpatients (71.7%), while 28.3% required inpatient care.

Clinically, dengue fever (DF) was the most common presentation, accounting for 70.0% of patients. Dengue hemorrhagic fever (DHF) was observed in 23.3%, while dengue shock syndrome (DSS) represented the smallest subgroup (6.7%).

A significant proportion of patients (36.7%) had hypocalcemia, while 63.3% maintained normal calcium levels. Among those with hypocalcemia (n=44), the majority had mild hypocalcemia (45.5%), followed by moderate (31.8%) and severe hypocalcemia (22.7%).

The distribution of calcium abnormalities varied by disease severity. In DF patients, 71.4% maintained normal calcium levels, while 28.6% had varying degrees of hypocalcemia. In DHF, only 50.0% had normal calcium, with the remaining half distributed across mild, moderate, and severe categories. DSS patients showed the highest burden of hypocalcemia, with only 25.0% having normal calcium and the rest equally distributed across the three hypocalcemia categories.

Thrombocytopenia was common, with 60.0% of outpatients and 28.3% of inpatients presenting with low platelet counts. Among the inpatients, 82.4% (28/34) required platelet transfusions, representing 23.3% of the overall cohort.

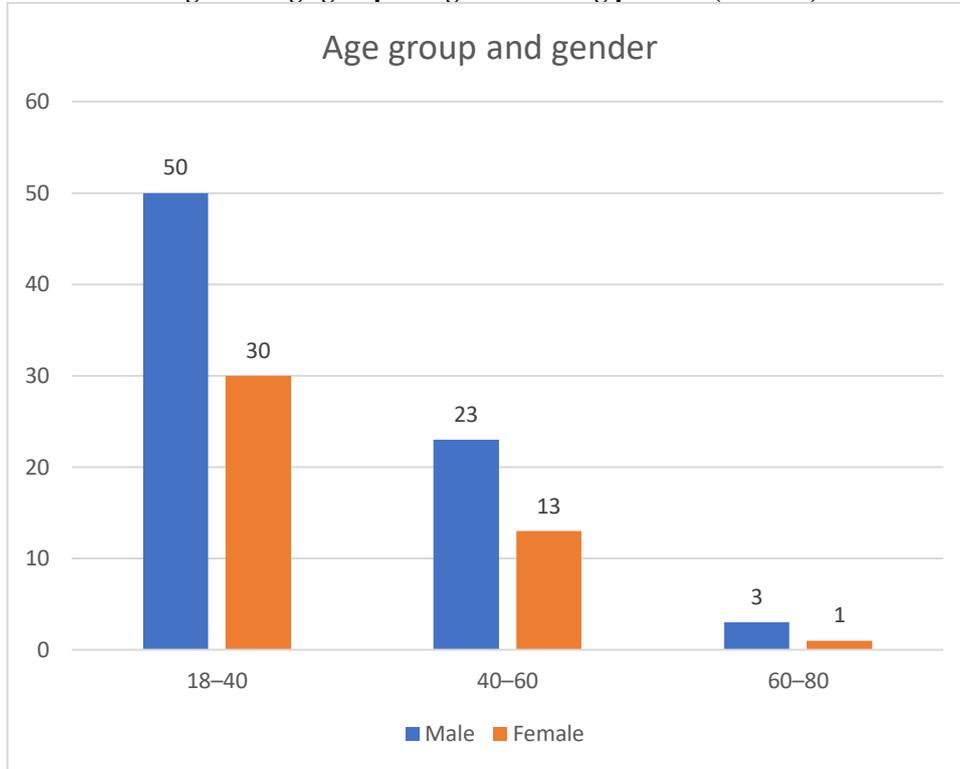
Among the 34 inpatients, most admissions lasted ≤ 5 days (41.2%), followed by 5–10 days (32.4%), while 14.7% required prolonged hospitalization beyond 10 days. The overall case fatality rate was 3.3% (4/120). Mortality was predominantly seen in patients with DSS (2.5%), followed by DHF (0.8%), while no deaths occurred among DF patients.

**Table 1. Baseline characteristics of patients (N = 120)**

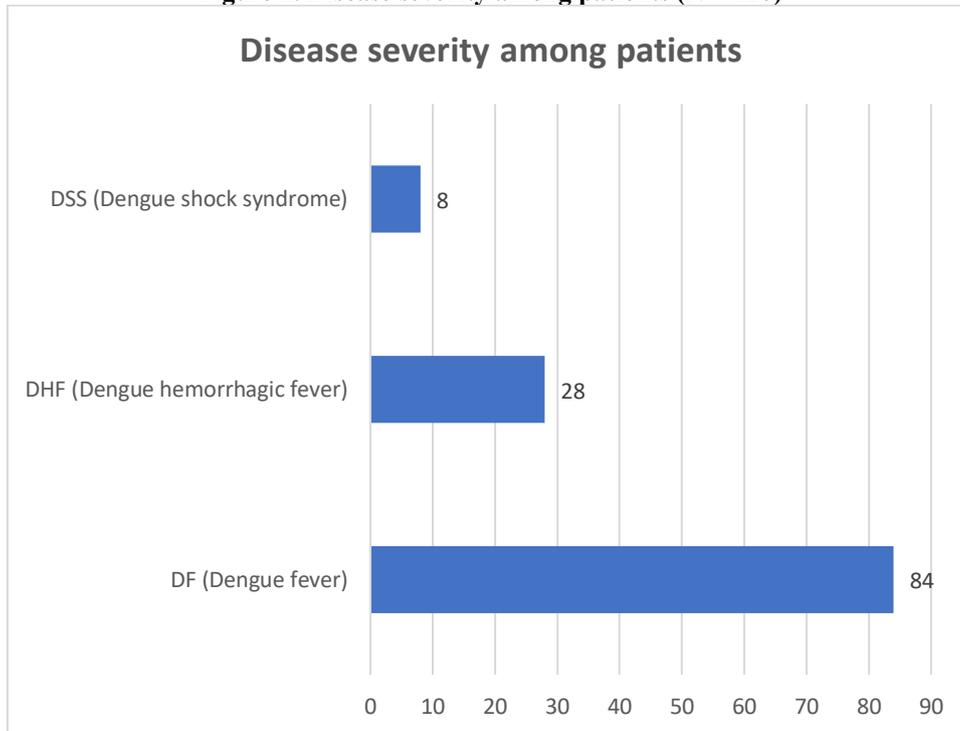
Category	Subgroup	Total n (%)
Age group	18–40	80 (66.7)

	40–60	36 (30.0)
	60–80	04 (3.3)
<b>Sex</b>	Male	76 (63.3)
	Female	44 (36.7)
<b>Patient type</b>	Outpatients	86 (71.7)
	Inpatients	34 (28.3)

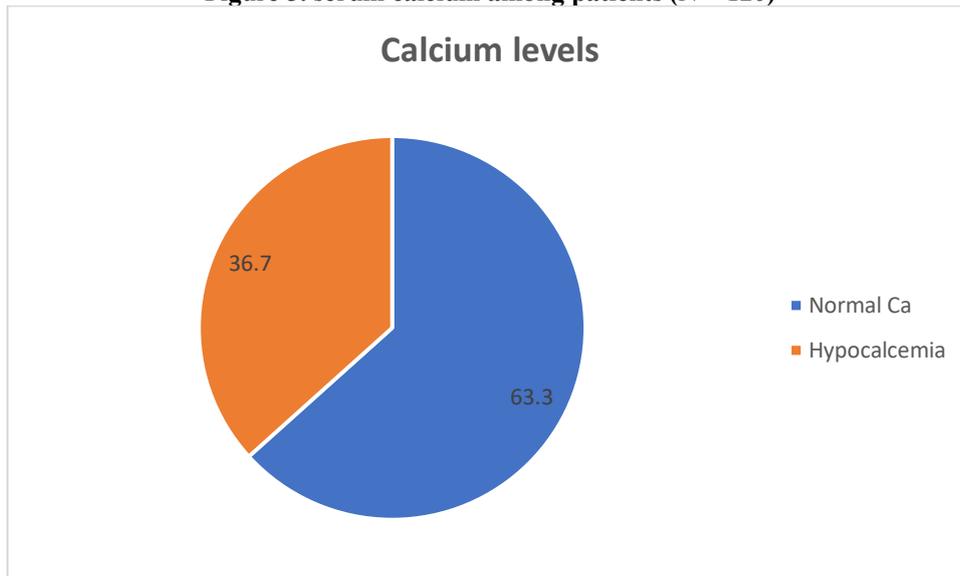
**Figure 2. Age group and gender among patients (N = 120)**



**Figure 2. Disease severity among patients (N = 120)**



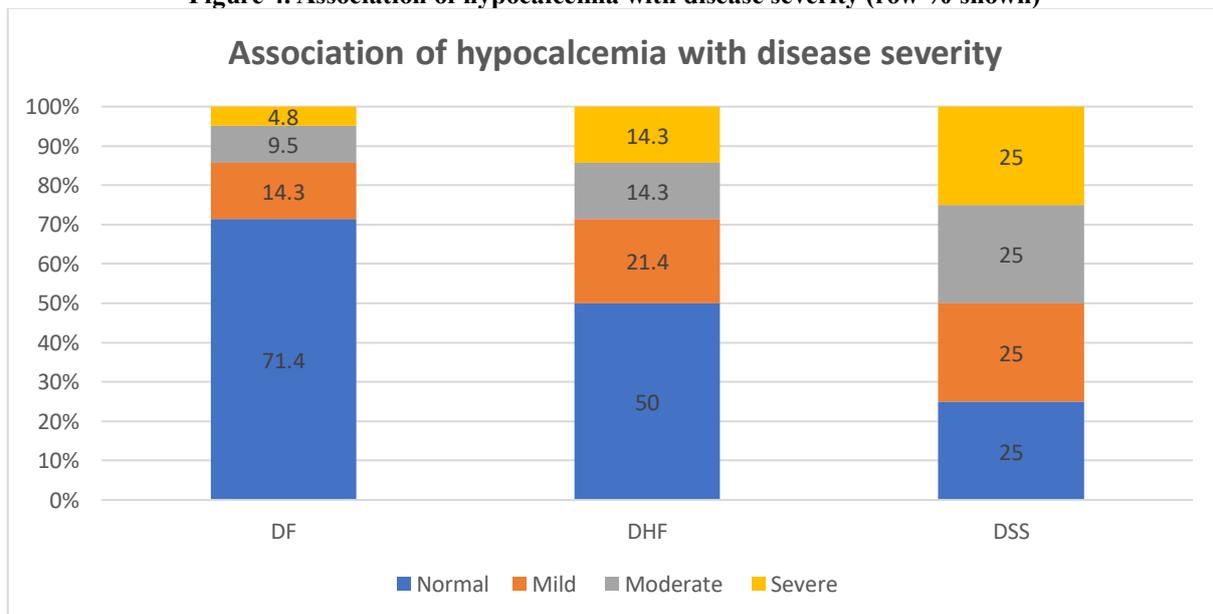
**Figure 3. serum calcium among patients (N = 120)**



**Table 2. Hypocalcemia grading (n = 44)**

Severity	Range (mg/dL)	n	%
Mild	8.0 – 8.4	20	45.5
Moderate	7.1 – 8.0	14	31.8
Severe	< 7.0	10	22.7

**Figure 4. Association of hypocalcemia with disease severity (row % shown)**



**Table 3. Platelet counts and transfusion (N = 120)**

Category	n	%
Low platelet count (OP)	72	60.0
Low platelet count (IP)	34	28.3
Platelet transfusion (IP)	28	23.3

**Table 4. Duration of hospital stay (inpatients, n = 34)**

Duration	n	%
≤ 5 days	14	41.2
5–10 days	11	32.4
> 10 days	05	14.7

**Table 5. Mortality distribution (N = 120)**

Mortality	n	%
DSS	03	2.5
DHF	01	0.8
Total	04	3.3

## DISCUSSION

In our study, a total of 120 seropositive dengue patients were included. The majority were young adults aged 18–40 years (66.7%), followed by 40–60 years (30.0%), with only a small proportion (3.3%) above 60 years. There was a clear male predominance (63.3%), and most patients were managed as outpatients (71.7%). Similar demographic trends have been reported in earlier studies. Constantine GR et al. [6] observed a mean age of 26.1 years with male predominance (59.3%), while Joshi A et al. [7] reported a slightly higher mean age of 39.1 years with males comprising 69.3% of cases. Likewise, Thomas RT et al. [9] noted a mean age of 30 years with 70.8% males, and Sheshan VS et al. [10] also found the majority of patients in the 18–25 years age group (46%) with 72% males. These consistent findings across studies highlight that dengue predominantly affects young adults with a male predominance in endemic regions.

Regarding clinical spectrum, in our study dengue fever (DF) was the most common presentation (70.0%), followed by dengue hemorrhagic fever (23.3%) and dengue shock syndrome (6.7%). By contrast, Constantine GR et al. [6] reported a higher proportion of DHF (52.6%). Similarly, Thomas RT et al. [9] found that 45.8% of cases were severe dengue, a higher proportion than in our study. In contrast, Sheshan VS et al. [10] reported that most patients presented with classical dengue (65%) and only 5% developed DSS, which is closer to our observations. These differences may reflect variations in patient selection, referral patterns, and disease outbreaks across study settings.

Calcium abnormalities were a prominent feature in our study, with hypocalcemia observed in 36.7% of patients. Among these, mild hypocalcemia was most common (45.5%), followed by moderate (31.8%) and severe (22.7%). Comparable prevalence was reported by Joshi A et al. [7], who noted hypocalcemia in 40.7% of patients with a similar distribution of mild, moderate, and severe cases. Constantine GR et al. [6] reported mean calcium levels of 1.05 mmol/L (range 0.77–1.24), while Joshi A et al. [7] found a mean admission calcium level of 8.71 mg/dL. Remya SR et al. [8] also reported significantly lower calcium levels in severe dengue ( $7.25 \pm 0.6$  mg/dL) compared to non-severe cases ( $8.68 \pm 0.2$  mg/dL), further supporting the association of hypocalcemia with disease progression.

Our study demonstrated a strong correlation between hypocalcemia and disease severity, with 71.4% of DF patients having normal calcium levels compared to 50.0% in DHF and only 25.0% in DSS. Notably, 75.0% of DSS patients exhibited hypocalcemia, distributed equally across severity grades. Similar findings have been reported in the literature. Constantine GR et al. [6] observed hypocalcemia in 86.9% of DHF cases compared to 29.7% of DF cases, with mean calcium levels significantly higher in DF than in DHF ( $p < 0.05$ ). Joshi A et al. [7] also demonstrated that hypocalcemia was more frequent in severe dengue, with most cases of severe hypocalcemia occurring in DHF and DSS patients. Remya SR et al. [8] further showed that patients with hypocalcemia had significantly higher hematocrit and lower platelet counts compared to normocalcemic patients, and those with warning signs such as plasma leakage and bleeding had markedly reduced calcium levels. Thomas RT et al. [9] confirmed that mean corrected calcium levels were significantly lower in severe dengue ( $8.2 \pm 0.4$  mg/dL) compared to dengue fever ( $8.9 \pm 0.2$  mg/dL;  $p < 0.001$ ), with an optimum cut-off of  $\leq 8.4$  mg/dL predicting severe dengue with high sensitivity (84.85%) and specificity (97.44%). Similarly, Sheshan VS et al. [10] reported a statistically significant association between hypocalcemia and severity ( $\chi^2 = 94.08$ ;  $p = 0.00$ ). Collectively, these findings strongly establish hypocalcemia as a reliable biochemical marker of dengue severity.

Mortality in our study was 3.3%, with deaths occurring predominantly in DSS (2.5%) and DHF (0.8%), while none were recorded among DF patients. This pattern is consistent with other reports. Remya SR et al. [8] observed that patients who died had significantly lower calcium levels ( $6.1 \pm 0.7$  mg/dL) compared to those discharged or leaving against medical advice. Similarly, Thomas RT et al. [9] reported a 6% mortality rate among severe dengue patients, reinforcing the link between hypocalcemia and adverse outcomes.

Taken together, our study and previous literature consistently demonstrate that hypocalcemia is common in dengue and correlates with disease severity. The association of lower calcium levels with poor outcomes, including DSS and mortality, underscores the potential role of serum calcium as a simple and cost-effective biomarker for risk stratification in dengue patients.

## CONCLUSION

A significant proportion of dengue patients in our study were found to have hypocalcemia, and the degree of calcium deficiency correlated strongly with disease severity. Patients with severe forms of dengue, including DHF and DSS, demonstrated higher prevalence and greater grades of hypocalcemia compared to those with classical dengue fever. These

findings suggest that serum calcium estimation is a simple, cost-effective, and underutilized tool that can serve as an adjunct marker for assessing disease severity and progression.

Routine monitoring of calcium levels in dengue patients may therefore facilitate early identification of those at risk for severe disease, allowing timely initiation of supportive interventions that could help reduce morbidity and mortality. Our observations further highlight the importance of integrating biochemical parameters, in addition to clinical and hematological markers, into standard dengue management protocols.

However, given the relatively modest sample size and single-center design of the present study, larger multicenter trials are warranted to validate these results, establish robust cut-off values for risk stratification, and explore the therapeutic implications of calcium supplementation in improving patient outcomes.

## REFERENCES

1. Akinsulie OC, Idris I. Global re-emergence of dengue fever: The need for a rapid response and surveillance. *The Microbe* [Internet]. 2024 Sep [cited 2025 Sep 30];4:100107. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S2950194624000748>
2. Tejo AM, Hamasaki DT, Menezes LM, Ho YL. Severe dengue in the intensive care unit. *Journal of Intensive Medicine* [Internet]. 2024 Jan [cited 2025 Sep 30];4(1):16–33. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S2667100X23000567>
3. Kalayanarooj S. Clinical manifestations and management of dengue/dhf/dss. *Trop Med Health*. 2011 Dec;39(4 Suppl):83–7.
4. Kapoor S, Singh A. Hypocalcemic tetany: an infrequently recognized association with acute dengue infection. *Indian J Pediatr*. 2012 Dec;79(12):1673.
5. Shivanthan MC, Rajapakse S. Dengue and calcium. *Int J Crit Illn Inj Sci*. 2014;4(4):314–6.
6. Constantine GR, Rajapakse S, Ranasinghe P, Parththipan B, Wijewickrama A, Jayawardana P. Hypocalcemia is associated with disease severity in patients with dengue. *J Infect Dev Ctries*. 2014 Sep 12;8(9):1205–9.
7. Joshi A, Sahu MC, Arun G. Prevalence, severity and clinical impact of hypocalcemia in dengue fever patients. *Int J Mosq Res* [Internet]. 2024 Jan 1 [cited 2025 Sep 30];11(4):102–7. Available from: <https://www.dipterajournal.com/archives/2024/11/4/B/11-4-15>
8. Remya S R, Anil Kumar Kem, Richa Sharma. Role of serum calcium levels as a biomarker for dengue severity and prognosis: insights from a cross-sectional analytic study. *Natl J Med Res* [Internet]. 2024 Apr 1 [cited 2025 Sep 30];14(02):56–60. Available from: <https://njmr.in/index.php/file/article/view/978>
9. Thomas RT, Sanghamithra P. Cross sectional study on the relationship between serum calcium level and severity of dengue fever. *ijhs* [Internet]. 2022 Oct 19 [cited 2025 Sep 30];3865–73. Available from: <https://sciencescholar.us/journal/index.php/ijhs/article/view/13495>
10. Sheshan VS, Deepali, Shenoy GC, Sudheendra, Kavya ST. Analysis of hypocalcemia in dengue and correlation of serum calcium levels with severity of dengue disease. *Academia Journal of Medicine* [Internet]. 2021 Jun 26 [cited 2025 Sep 30];4(1):74–7. Available from: <https://www.journals.acspublisher.com/index.php/ajm/article/view/18929>.