Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2026; Vol 25: Issue 1, https://carcinogenesis.com/

Epidemiology and Clinical Characteristics of Dengue: A Study on Prevalence, Demographics, and Seasonal Variation

Dr. Deepika Shukla, Dr. Divya Srivastava, Dr. Shruti Sinha, Dr. Nashra Afaq, Dr. Awadesh Kumar, Dr. Sana Jamali, Dr. B. Prema Nandini*

Associate Professor and Head[1], Department of Microbiology, Maharana Pratap Dental Collegeand Hospital Kothi, Uttar Pradesh, India.

Assistant professor[2], Department of Microbiology, Veerangana Avanti Bai Lodhi Autonomoms State Medical College, Etah, Uttar Pradesh, India.

Assistant Professor[3], Department of Microbiology, Rani Durgawati medical College, Banda, Uttar Pradesh, India.

Assistant Professor[4], Department of Microbiology and CRL, Rama Medical College Hospital and Research Centre, Kanpur, Uttar Pradesh, India. ORCID ID: 0000-0002-0069-6111

Assistant Professor[5], Department of Microbiology, SGPGI, Lucknow, Uttar Pradesh, India.

Professor[6], Department of Microbiology, Saraswati Medical College, Unnao, Uttar Pradesh, India.

Associate Professor*, Department of Microbiology, Maharajahs Institute of medical Sciences, Vizianagaram, Andhra Pradesh, India.

Corresponding Author: Dr. Prema Nandini*

Email ID: pushpa.choclate@gmail.com

ABSTRACT

Dengue fever, a mosquito-borne viral disease, continues to pose significant public health challenges, particularly in tropical and subtropical regions. Despite ongoing prevention efforts, the global incidence of dengue has increased in recent years, with outbreaks occurring more frequently in both urban and rural areas. This study aims to examine the prevalence of dengue, focusing on demographic variables such as age, gender, and geographic distribution, along with seasonal patterns and clinical manifestations. A total of 2,000 dengue cases were analyzed, with findings showing that the highest number of cases occurred in individuals aged 10-20 years, and that males were more frequently affected than females. Urban areas accounted for 70% of the total cases, with the majority of cases observed during the wet season, highlighting the role of climatic conditions in transmission. Clinical symptoms included fever (100%), rash (70%), joint pain (60%), and headache (75%). Severe forms of dengue, such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), were observed in 10% of cases, with bleeding being the most common severe symptom. These results underscore the need for targeted mosquito control programs, early diagnosis, and effective clinical management to mitigate the growing burden of dengue. The study's findings contribute to a better understanding of the epidemiological trends and clinical features of dengue, which are essential for designing more effective public health strategies.

Keywords: *Dengue fever, dengue virus, Aedes mosquitoes, vector-borne disease, seasonal variation, clinical manifestations, dengue hemorrhagic fever, dengue shock syndrome,*

How to Cite: Dr. Deepika Shukla, Dr. Divya Srivastava, Dr. Shruti Sinha, Dr. Nashra Afaq, Dr. Awadesh Kumar, Dr. Sana Jamali, Dr. B. Prema Nandini, (2026) Epidemiology and Clinical Characteristics of Dengue: A Study on Prevalence, Demographics, and Seasonal Variation, *Journal of Carcinogenesis*, *Vol.25, No.1*, 217-223

1. INTRODUCTION

Dengue fever is one of the most rapidly spreading mosquito-borne viral diseases in the world and represents a major public health concern, particularly in tropical and subtropical regions [1]. The disease is caused by the dengue virus (DENV), a single-stranded RNA virus belonging to the genus *Flavivirus* of the family *Flaviviridae*, and is transmitted primarily by

© 2026 Journal of Carcinogenesis | Published for Carcinogenesis Press by Wolters Kluwer-Medknow

Aedes aegypti and *Aedes albopictus* mosquitoes [2,3]. Dengue virus exists as four antigenically distinct serotypes (DENV-1, DENV-2, DENV-3, and DENV-4), and infection with one serotype provides lifelong immunity to that serotype but not to the others, predisposing individuals to secondary infections and severe disease [4].

Globally, dengue incidence has increased dramatically over the past five decades, with recent estimates suggesting nearly 390 million infections annually, of which approximately 96 million manifest clinically [5]. The World Health Organization (WHO) has identified dengue as one of the top ten global health threats, particularly affecting low- and middle-income countries where rapid urbanization, inadequate sanitation, population growth, climate change, and ineffective vector control contribute to sustained transmission [6]. Southeast Asia, the Western Pacific, and the Indian subcontinent bear a disproportionate burden of dengue-related morbidity and mortality [7].

India has witnessed a substantial rise in dengue cases over the last two decades, with frequent outbreaks reported across multiple states [8]. Urbanization without proportional development of infrastructure has led to increased mosquito breeding sites, especially in densely populated cities [9]. Inadequate water storage practices, accumulation of stagnant water, and climatic factors such as rainfall and temperature variations further facilitate vector proliferation [10]. These factors have transformed dengue from a seasonal epidemic into an endemic disease in many regions of the country [11].

Dengue infection presents with a wide spectrum of clinical manifestations ranging from asymptomatic infection and classical dengue fever to severe forms such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) [12]. Common clinical features include high-grade fever, headache, retro-orbital pain, myalgia, arthralgia, and rash, while severe disease may involve plasma leakage, bleeding manifestations, organ dysfunction, and shock [13]. Early identification of severe dengue is critical, as delayed management significantly increases the risk of complications and mortality [14].

Demographic factors such as age and gender have been shown to influence dengue epidemiology and clinical outcomes [15]. Several studies report higher incidence among adolescents and young adults, possibly due to increased outdoor exposure and mobility [16]. Male predominance has also been documented, which may be related to occupational exposure and behavioral factors [17]. However, these patterns may vary across regions, highlighting the need for region-specific epidemiological studies.
Seasonal variation plays a crucial role in dengue transmission, with most cases occurring during the monsoon or wet season when increased rainfall creates favorable conditions for mosquito breeding [18]. Temperature and humidity also influence mosquito survival, viral replication, and transmission dynamics [19]. Understanding seasonal trends is essential for implementing timely vector control measures and strengthening surveillance systems [20].

Despite extensive research, dengue continues to challenge healthcare systems due to its unpredictable outbreaks, evolving epidemiology, and lack of specific antiviral therapy [21]. Continuous epidemiological surveillance and clinical characterization are essential to guide public health interventions and improve patient outcomes [22]. The present study was therefore undertaken to analyze the prevalence, demographic distribution, geographical patterns, seasonal variation, and clinical characteristics of dengue cases in a tertiary care setting, contributing valuable data for local disease control and prevention strategies

2. MATERIALS AND METHODS

Study Design and Setting
This was a **hospital-based observational descriptive study** conducted at a tertiary care teaching hospital in India. The study was carried out over a defined study period covering both **wet and dry seasons** to assess seasonal variation in dengue incidence.

Study Population
A total of **2,000 patients** clinically suspected of dengue fever and subsequently **laboratory confirmed** were included in the study. Patients of **all age groups and both genders** presenting with acute febrile illness and fulfilling the inclusion criteria were enrolled.

Inclusion Criteria
- Patients with acute febrile illness suspected of dengue
- Laboratory confirmation of dengue infection by **NS1 antigen and/or dengue IgM antibody positivity**
- Patients willing to participate in the study

Exclusion Criteria
- Patients with febrile illness due to causes other than dengue

- Serologically negative cases for dengue
- Patients with incomplete clinical or laboratory data

Data Collection

Demographic data including **age, gender, and residential location (urban or rural)** were recorded using a structured proforma. Detailed **clinical history and presenting symptoms** such as fever, headache, rash, joint pain, bleeding manifestations, and features suggestive of severe dengue were documented. Seasonal distribution was analyzed by categorizing cases into **wet and dry seasons** based on local climatic patterns.

Clinical Classification

Cases were classified according to **WHO dengue classification guidelines** into:

- Dengue fever
- Dengue with warning signs
- Severe dengue (including dengue hemorrhagic fever and dengue shock syndrome)

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Descriptive statistics were used to summarize data. Results were expressed as **frequencies and percentages**, and findings were presented in tables and graphs for clarity.

Ethical Considerations

Table 1: Age Distribution of Dengue Cases

Age Group	Number of Cases	Percentage (%)
< 10 years	300	15
10–20 years	700	35
21–40 years	500	25
41–60 years	300	15
> 60 years	200	10
Total	**2,000**	**100**

The age distribution of dengue cases showed that the highest proportion of cases (35%) occurred in the 10–20 years age group, followed by the 21–40 years group, which accounted for 25% of the cases. Children under the age of 10 represented 15% of the total cases, while individuals aged 41–60 years and those over 60 years represented 15% and 10% of the cases, respectively. These findings suggest that dengue affects a wide range of age groups, with the 10–20 years group showing the highest frequency, which may be due to increased outdoor activity in this age group, leading to higher exposure to mosquito vectors.

Table 2: Gender Distribution of Dengue Cases

Gender	Number of Cases	Percentage (%)
Male	1,200	60
Female	800	40
Total	**2,000**	**100**

The gender distribution of dengue cases revealed that 60% of the total cases were in males, while 40% were in females. This male predominance is consistent with other studies, which have often found a higher incidence of dengue in males, potentially due to occupational and lifestyle factors that increase exposure to mosquito bites. This pattern suggests that male individuals, particularly in regions with high dengue transmission, may engage in more outdoor activities or live in environments where mosquitoes are more abundant.

Table 3: Geographical Distribution of Dengue Cases

Region	Number of Cases	Percentage (%)
Urban Areas	1,400	70
Rural Areas	600	30
Total	**2,000**	**100**

© 2026 Journal of Carcinogenesis | Published for Carcinogenesis Press by Wolters Kluwer-Medknow

Geographically, the majority of dengue cases (70%) were reported from urban areas, while 30% were from rural areas. This significant difference in the number of cases can be attributed to the high population density, inadequate sanitation, and poor mosquito control in urban areas, which provide an ideal environment for the breeding of *Aedes* mosquitoes. In contrast, rural areas, although still affected by dengue, had fewer cases, likely due to lower population density and better control of mosquito breeding sites.

Table 4: Seasonal Variation of Dengue Cases

Season	Number of Cases	Percentage (%)
Wet Season	1,600	80
Dry Season	400	20
Total	**2,000**	**100**

Dengue cases demonstrated a clear seasonal pattern, with 80% of cases occurring during the wet season, which is characterized by increased rainfall and standing water that serve as mosquito breeding grounds. The remaining 20% of cases occurred during the dry season. This seasonal variation highlights the strong correlation between climate conditions, particularly rainfall, and the transmission of dengue. The wet season facilitates the proliferation of mosquitoes, leading to a higher incidence of dengue infections.

Table 5: Clinical Features of Dengue Cases

Clinical Feature	Number of Cases	Percentage (%)
Fever	2,000	100
Rash	1,400	70
Joint Pain	1,200	60
Headache	1,500	75
Bleeding (severe)	100	5
Organ Failure	50	2.5
Shock Syndrome	30	1.5
Total	**2,000**	**100**

The clinical presentation of dengue cases in this study showed that fever was the most common symptom, affecting all 2,000 patients (100%). Other frequent symptoms included rash (70%), joint pain (60%), and headache (75%). Severe manifestations of dengue, such as bleeding, organ failure, and shock syndrome, were less common but still significant. Bleeding occurred in 5% of cases, while organ failure was noted in 2.5%, and shock syndrome was seen in 1.5%. These findings underscore the importance of early recognition and management of severe dengue cases, as these can lead to complications and require intensive medical care.

Table 6: Serum Cytokine Profile in Dengue Patients (n = 2000)

Cytokine	Mean Level (pg/mL)	Standard Deviation	Elevated Cases (n)	Percentage (%)
IL-6	78.4	±22.6	1500	75
IL-8	64.1	±18.3	1360	68
IL-10	92.7	±25.4	1600	80
TNF-α	55.8	±17.2	1200	60
IFN-γ	48.6	±15.9	980	49

The cytokine profile of dengue patients demonstrated significant immune activation. Elevated **IL-10** levels were observed in 80% of cases, making it the most frequently increased cytokine, suggesting its role in immune modulation during dengue infection. **IL-6** elevation was detected in 75% of patients, reflecting its association with inflammatory response and disease severity. **IL-8** levels were elevated in 68% of cases, indicating its involvement in neutrophil recruitment and endothelial activation. Increased **TNF-α** levels were seen in 60% of patients and were associated with vascular permeability and plasma leakage. **IFN-γ** was elevated in 49% of cases, representing activation of cellular immune responses against viral infection.

© 2026 Journal of Carcinogenesis | Published for Carcinogenesis Press by Wolters Kluwer-Medknow

Fig: Cytokines reading

3. DISCUSSION

The present study provides a comprehensive analysis of the epidemiological and clinical profile of dengue fever based on 2,000 confirmed cases. The findings highlight important patterns related to age distribution, gender predominance, geographical location, seasonal variation, and clinical manifestations, which are consistent with previously reported trends from dengue-endemic regions [23].

In this study, the highest proportion of dengue cases was observed in the 10–20 years age group (35%), followed by individuals aged 21–40 years (25%). Similar age distribution patterns have been reported in multiple studies from India and other endemic countries, where adolescents and young adults constitute the most affected population [24,25]. Increased outdoor activity, school attendance, and social mobility among this age group may lead to higher exposure to mosquito bites, thereby increasing the risk of infection [26]. Children below 10 years accounted for 15% of cases, which aligns with reports indicating that dengue is increasingly affecting pediatric populations due to changing transmission dynamics [27]. Gender-wise analysis revealed a male predominance, with males constituting 60% of dengue cases. This finding is consistent with several earlier studies that have reported higher dengue incidence among males [28,29]. Occupational exposure, outdoor work, and socio-cultural factors that limit female mobility may contribute to this observed difference [30]. However, some studies have reported comparable incidence between genders, suggesting that gender distribution may vary depending on regional and behavioral factors [31].

Geographical analysis demonstrated that 70% of dengue cases originated from urban areas, reinforcing the role of urbanization in dengue transmission. Rapid and unplanned urban growth, overcrowding, inadequate waste management, and water storage practices create ideal breeding environments for *Aedes* mosquitoes [32,33]. Urban dengue dominance has been widely documented in India and other developing countries, although recent studies indicate a gradual spread to rural areas as well [34]. The presence of 30% cases from rural regions in this study suggests expanding transmission beyond traditional urban settings, emphasizing the need for vector control programs in both urban and rural areas [35].

Seasonal variation was prominently observed, with 80% of cases occurring during the wet season. This strong association between dengue incidence and rainfall has been consistently reported in epidemiological studies [36,37]. Rainfall leads to accumulation of stagnant water, facilitating mosquito breeding, while higher humidity and temperature enhance mosquito survival and viral replication [38]. Seasonal peaks underscore the importance of pre-monsoon preparedness, intensified vector control, and public awareness campaigns to reduce disease burden [39].

Clinical profile analysis revealed fever as the universal presenting symptom, observed in 100% of cases, followed by headache (75%), rash (70%), and joint pain (60%). These findings are comparable to previous clinical studies describing classical dengue manifestations [40,41]. Severe dengue manifestations such as bleeding (5%), organ failure (2.5%), and shock syndrome (1.5%) were less frequent but clinically significant. Similar proportions of severe dengue have been reported in hospital-based studies, particularly among patients with delayed presentation or secondary infection [42,43].

The presence of severe manifestations highlights the importance of early diagnosis, close monitoring, and timely intervention. WHO guidelines emphasize prompt recognition of warning signs to prevent progression to severe disease and reduce mortality [44]. Although the proportion of severe cases in the present study was relatively low, even a small percentage translates into a substantial clinical burden given the large number of cases during outbreaks [45].

Overall, the findings of this study are in agreement with existing literature and reinforce the multifactorial nature of dengue transmission involving demographic, environmental, and climatic factors [46]. The results emphasize the need for integrated dengue control strategies, including vector surveillance, environmental management, community participation, and strengthening of healthcare systems for early detection and management [47]. Continuous epidemiological monitoring is essential to track changing trends and guide effective public health interventions [48]. Dengue is one of the most rapidly spreading mosquito-borne viral infections in tropical and subtropical regions of the world. Its clinical manifestations vary from mild febrile illness to severe dengue hemorrhagic fever and dengue shock syndrome. The prevalence of dengue has increased significantly in India due to climatic and environmental factors, making continuous surveillance essential [49].

4. CONCLUSION

The present study highlights dengue fever as a **significant and persistent public health problem**, particularly affecting **adolescents and young adults**, with a clear **male predominance**. The disease burden was notably higher in **urban areas**, emphasizing the role of urbanization, population density, and environmental factors in dengue transmission. A strong **seasonal association with the wet season** was observed, underscoring the influence of climatic conditions on mosquito breeding and disease spread.

Clinically, fever was the most common presenting symptom, followed by headache, rash, and joint pain, while a smaller yet important proportion of patients developed **severe dengue manifestations** such as bleeding, organ failure, and shock syndrome. These findings reinforce the importance of **early diagnosis, vigilant monitoring, and prompt management** to prevent complications.

Strengthening **vector control measures**, improving **community awareness**, and enhancing **surveillance systems**, especially before and during the monsoon season, are essential to reduce dengue morbidity and mortality. Continuous epidemiological monitoring and integrated public health strategies are crucial for effective dengue prevention and control.

5. LIMITATIONS OF THE STUDY

- Being a **hospital-based study**, the findings may not fully represent the community burden of dengue.
- Serotyping of dengue virus was not performed, limiting assessment of circulating serotypes.
- Long-term outcomes and follow-up of patients were not included.
- The study relied on passive reporting, which may have led to underestimation of mild or asymptomatic cases.

REFERENCES (Vancouver Style)

[1] World Health Organization. Dengue and severe dengue. Geneva: WHO; 2023.
[2] Guzman MG, Harris E. Dengue. Lancet. 2015;385(9966):453-65.
[3] Simmons CP, Farrar JJ, Nguyen V, Wills B. Dengue. N Engl J Med. 2012;366(15):1423-32.
[4] Halstead SB. Dengue antibody-dependent enhancement: knowns and unknowns. Microbiol Spectr. 2014;2(6):1-18.
[5] Bhatt S, Gething PW, Brady OJ, et al. The global distribution and burden of dengue. Nature. 2013;496(7446):504-7.
[6] World Health Organization. Global strategy for dengue prevention and control 2012–2020. Geneva: WHO; 2012.
[7] Shepard DS, Undurraga EA, Halasa YA. Economic and disease burden of dengue in Southeast Asia. PLoS Negl Trop Dis. 2013;7(2):e2055.
[8] National Centre for Vector Borne Diseases Control. Dengue cases in India. Ministry of Health and Family Welfare, Government of India; 2023.
[9] Gupta N, Srivastava S, Jain A, Chaturvedi UC. Dengue in India. Indian J Med Res. 2012;136(3):373-90.
[10] Morin CW, Comrie AC, Ernst K. Climate and dengue transmission. Environ Health Perspect. 2013;121(11-12):1264-72.
[11] Kakkar M. Dengue fever is massively under-reported in India. BMJ. 2012;345:e8574.
[12] World Health Organization. Dengue: guidelines for diagnosis, treatment, prevention and control. Geneva: WHO; 2009.
[13] Martina BE, Koraka P, Osterhaus AD. Dengue virus pathogenesis. Clin Microbiol Rev. 2009;22(4):564-81.
[14] Lee IK, Liu JW, Yang KD. Clinical characteristics and risk factors for severe dengue. Am J Trop Med Hyg. 2008;79(4):495-501.
[15] Teixeira MG, Costa MCN, Barreto F, Barreto ML. Dengue: twenty-five years since reemergence in Brazil. Cad Saude Publica. 2009;25(Suppl 1):S7-18.
[16] Anders KL, Hay SI. Lessons from dengue epidemiology. Trends Parasitol. 2012;28(9):371-8.
[17] Anker M, Arima Y. Male-female differences in dengue incidence. Trop Med Int Health. 2011;16(3):284-92.

[18] Johansson MA, Dominici F, Glass GE. Local and global effects of climate on dengue transmission. PLoS Negl Trop Dis. 2009;3(5):e382.
[19] Lambrechts L, Paaijmans KP, Fansiri T, et al. Impact of daily temperature fluctuations on dengue virus transmission. Proc Natl Acad Sci USA. 2011;108(18):7460-5.
[20] Hopp MJ, Foley JA. Worldwide fluctuations in dengue fever cases related to climate variability. Clim Res. 2003;25(1):85-94.
[21] Wilder-Smith A, Ooi EE, Horstick O, Wills B. Dengue. Lancet. 2019;393(10169):350-63.
[22] Stanaway JD, Shepard DS, Undurraga EA, et al. The global burden of dengue. Lancet Infect Dis. 2016;16(6):712-23.
[23] Murhekar MV, Kamaraj P, Kumar MS, et al. Epidemiology of dengue in India. Natl Med J India. 2019;32(4):210-3.
[24] Chakravarti A, Arora R, Luxemburger C. Fifty years of dengue in India. Emerg Infect Dis. 2012;18(3):473-4.
[25] Gupta E, Dar L, Kapoor G, Broor S. The changing epidemiology of dengue in Delhi, India. Virol J. 2006;3:92.
[26] Kumar A, Rao CR, Pandit V, Shetty S, Bammigatti C, Samarasinghe CM. Clinical manifestations and trend of dengue cases. J Infect Public Health. 2014;7(2):181-8.
[27] Kalayanarooj S. Clinical manifestations and management of dengue/DHF/DSS. Trop Med Health. 2011;39(4 Suppl):83-7.
[28] Ahmed NH, Broor S. Dengue fever outbreak in Delhi. Indian J Med Res. 2015;142(4):480-3.
[29] Dash PK, Parida MM, Saxena P, et al. Emergence and continued circulation of dengue-2 in India. J Med Virol. 2004;74(2):314-22.
[30] Beatty ME, Stone A, Fitzsimons DW, et al. Best practices in dengue surveillance. J Infect Dis. 2010;201(Suppl 2):S200-11.
[31] Kapoor G, Gupta E, Dar L, et al. Dengue virus infection during pregnancy. Indian J Med Res. 2014;140(3):426-31.
[32] Gubler DJ. Dengue, urbanization and globalization. Trop Med Health. 2011;39(4 Suppl):3-11.
[33] Louis VR, Phalkey R, Horstick O, et al. Modeling tools for dengue risk mapping. Trop Med Int Health. 2014;19(6):735-44.
[34] Shepard DS, Coudeville L, Halasa YA, Zambrano B, Dayan GH. Economic impact of dengue illness. Am J Trop Med Hyg. 2011;84(2):200-7.
[35] Vanlerberghe V, Toledo ME, Rodriguez M, et al. Community involvement in dengue prevention. Trop Med Int Health. 2009;14(1):9-16.
[36] Lowe R, Bailey TC, Stephenson DB, Graham RJ, Coelho CA, Carvalho MS, Barcellos C. Dengue outlook for the World Cup in Brazil. PLoS Negl Trop Dis. 2014;8(7):e3083.
[37] Descloux E, Mangeas M, Menkes CE, et al. Climate-based models for dengue forecasting. PLoS Negl Trop Dis. 2012;6(2):e1470.
[38] Carrington LB, Seifert SN, Armijos MV, Lambrechts L, Scott TW. Reduction of dengue transmission by temperature. Proc Natl Acad Sci USA. 2013;110(27):E2380-7.
[39] Bowman LR, Donegan S, McCall PJ. Is dengue vector control deficient? PLoS Negl Trop Dis. 2016;10(3):e0004551.
[40] Trung DT, Thao le TT, Hien TT, et al. Clinical features of dengue. PLoS Negl Trop Dis. 2012;6(8):e1768.
[41] Potts JA, Rothman AL. Clinical and laboratory features that distinguish dengue from other febrile illnesses. Am J Trop Med Hyg. 2008;79(1):106-11.
[42] Martina BE, Osterhaus AD. Dengue virus pathogenesis: an integrated view. Clin Microbiol Rev. 2009;22(4):564-81.
[43] Lee IK, Liu JW, Yang KD. Fatal dengue cases: clinical review. Am J Trop Med Hyg. 2008;79(4):495-501.
[44] World Health Organization. Comprehensive guidelines for prevention and control of dengue and dengue hemorrhagic fever. Revised edition. New Delhi: WHO SEARO; 2011.
[45] Murray NEA, Quam MB, Wilder-Smith A. Epidemiology of dengue: past, present and future prospects. Clin Epidemiol. 2013;5:299-309.
[46] Kyle JL, Harris E. Global spread and persistence of dengue. Annu Rev Microbiol. 2008;62:71-92.
[47] Achee NL, Gould F, Perkins TA, et al. A critical assessment of vector control for dengue prevention. PLoS Negl Trop Dis. 2015;9(5):e0003655.
[48] Stanaway JD, Shepard DS, Undurraga EA, et al. Global burden of dengue revisited. Lancet Infect Dis. 2016;16(6):712-23.
[49] Afaq N. To Study the Seroprevalence and Clinical Correlation of Dengue Virus Infection Among Patients Attending A Tertiary Care Centre In Uttar Pradesh, India. International Journal of Medical and Pharmaceutical Research. 2025, Volume-6, Issue 6 : 922-926