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Original Article

Socio-Demographic and Clinical Characteristics of Children with Dengue Fever

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ABSTRACT

Introduction: *Dengue fever is a significant public health concern, particularly in tropical and subtropical regions. This study aims to investigate the socio-demographic and clinical characteristics of children with dengue fever at the Institute of Child and Mother Health (ICMH) in Bangladesh.* ***Methods & Materials:*** *This descriptive cross-sectional study was conducted over one year, involving 54 children aged 0-18 years diagnosed with dengue fever at ICMH. Data were collected using a pre-tested semi-structured questionnaire through face-to-face interviews and review of investigation reports. Data analysis was performed using SPSS version 21.* ***Results:*** *The majority of the participants were under 5 years of age (48.15%) and male (55.56%). A family history of dengue was reported in 24.07% of cases. Nutritional assessment showed 74.07% were of normal weight, with smaller proportions being obese, overweight, underweight, or malnourished. Most children experienced fever for less than 5 days (98.15%). High usage of mosquito nets (90.74%) and repellents (74.07%) was noted. Hospital stay duration varied, with 51.85% staying for 3-6 days. Clinical presentations included fever (100%), vomiting (81.48%), abdominal pain (35.19%), and rash (20.37%). Bleeding manifestations included skin bleeding (18.52%) and gum bleeding (14.81%). The tourniquet test was positive in 24.07% of cases. Hemoglobin levels were below 9.9 grams per deciliter in 22.22% of cases.* ***Conclusion:*** *The study provides valuable insights into the socio-demographic and clinical characteristics of pediatric dengue patients in Bangladesh. The findings highlight the need for targeted public health interventions and improved clinical management strategies to enhance patient outcomes.*

Keywords: *Dengue fever, Pediatric, Socio-demographic characteristics, Clinical features, Bangladesh*

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INTRODUCTION

Dengue fever is a significant public health concern globally, particularly in tropical and subtropical regions. It is caused by the dengue virus (DENV), which is transmitted primarily by Aedes aegypti mosquitoes. Dengue fever is endemic in over 100 countries and affects approximately 50 million people annually, with Southeast Asia, the Pacific, and the Americas being the most impacted regions[1]. The disease manifests in a broad spectrum of clinical presentations, ranging from asymptomatic or mild nonspecific fever to classic dengue fever (DF) and severe dengue forms, such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS)[2]. The global spread of dengue fever is facilitated by environmental conditions favorable for mosquito breeding and human factors such as urbanization and increased international travel, posing a significant threat to public health systems worldwide[3]. The dengue virus comprises four serotypes (DEN-1, DEN-2, DEN-3, and DEN-4), which belong to the genus Flavivirus. Each serotype can cause dengue fever, and infection with one serotype does not provide immunity against the others. This lack of cross-protection is a major challenge, as individuals in endemic areas can be infected up to four times, leading to higher risks of severe disease upon subsequent infections[4]. The existence of multiple serotypes complicates vaccine development and public health strategies due to the need for a tetravalent vaccine that offers protection against all serotypes[5]. Secondary infections with different serotypes often result in severe dengue due to antibody-dependent enhancement, where antibodies from a primary infection enhance the severity of a subsequent infection[6]. Bangladesh, a tropical country in South Asia, has seen a significant rise in dengue cases over recent years, culminating in severe outbreaks such as the 2019 epidemic, which recorded over 100,000 confirmed cases and numerous fatalities[7]. The increasing incidence and severity of dengue in Bangladesh can be attributed to several factors, including urbanization, inadequate public health infrastructure, and climate change, which creates favorable conditions for mosquito breeding[8]. During the 2019 outbreak, co-circulation of multiple serotypes (DENV-1, DENV-2, and

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DENV-3) was observed, contributing to more severe clinical manifestations and larger epidemic scales[9]. The socio-demographic characteristics of dengue cases reveal significant patterns. Globally, dengue predominantly affects individuals aged 5-14 years, with a slight male predominance[10]. In Bangladesh, studies have shown a similar trend, with the majority of cases occurring in males aged 20-40 years [11]. The socio-economic status of individuals also plays a crucial role in dengue susceptibility. Poor living conditions, inadequate housing, lack of access to healthcare, and poor public health infrastructure increase the risk of dengue outbreaks [12]. In urban areas of Bangladesh, higher seropositivity rates have been noted among individuals with higher socio-economic status, indicating the impact of urbanization and population density on dengue transmission[8]. The clinical manifestations of dengue fever are varied and can include high fever, severe headache, retro-orbital pain, myalgia, arthralgia, and a maculopapular rash. Gastrointestinal symptoms such as nausea, vomiting, abdominal pain, and diarrhea are also common[13]. In Bangladesh, common clinical presentations among children during dengue outbreaks include fever (100%), arthralgia (81.9%), cough/coryza (17.2%), headache/retro-orbital pain (3.4%), and rash (10.3%)[14]. Severe dengue cases, characterized by DHF and DSS, exhibit warning signs such as persistent vomiting, severe abdominal pain, hepatomegaly, and mucosal bleeding[13]. Plasma leakage, thrombocytopenia, and hemoconcentration are key pathophysiological findings in DHF/DSS, with complications such as pleural effusion and ascites commonly observed [12]. The need for vigilant surveillance, early diagnosis, and prompt clinical management is crucial in mitigating the impact of dengue fever. Despite the challenges posed by the existence of multiple serotypes and the severity of secondary infections, ongoing research and public health efforts aim to improve vaccine development and vector control measures [15]. Understanding the socio-demographic and clinical characteristics of dengue fever in specific populations, such as children in Bangladesh, is essential for tailoring effective public health interventions and improving clinical outcomes. This study aims to contribute valuable insights into these characteristics, ultimately aiding in the development of more effective strategies for managing and preventing dengue fever in vulnerable populations.

METHODS & MATERIALS

The study employed a descriptive cross-sectional design conducted at the Pediatric Outpatient Department (OPD) and Inpatient Department (IPD) of the Institute of Child and Mother Health (ICMH). The study population included all children aged 0 to 18 years who were diagnosed with dengue fever in the OPD and IPD of ICMH over a one-year period. A total of 54 patients, aged 0 to 18 years, diagnosed with dengue fever were included in the study. The inclusion criteria encompassed children within the specified age range who were diagnosed with dengue fever based on physical and clinical features and confirmed by laboratory investigations. Exclusion criteria were children with preexisting cardiac problems. Purposive sampling was utilized to select the study participants. Data collection was performed using a pre-tested semi-structured questionnaire. The data collection technique involved face-to-face interviews with the patients' parents or guardians, and the collection of investigation reports from the investigators. The data collected included routine examination findings, laboratory investigations, electrocardiograms (ECG), echocardiograms (Echo), and chest X-ray (CXR) reports. Weight was measured using a bathroom scale, and length was measured using an infantometer. Data management and analysis were conducted using SPSS version 21. The information obtained was presented in the form of tables, graphs, and charts. Data collection occurred during the dengue fever outbreak. Before the commencement of data collection, the questionnaire was pre-tested to ensure its reliability and validity. Ethical clearance for the study was obtained from the Institutional Review Board of ICMH. The nature and purpose of the study were explained to the parents or guardians of the children, and written informed consent was obtained from them. The age of the children was determined based on information provided by their parents or guardians. Ethical implications were thoroughly considered in this study. Permission was obtained from the Institutional Review Board of ICMH. Informed consent was secured from the study participants before starting the interviews. The respondents' right to refuse or withdraw from the study was respected, and confidentiality of their information was strictly maintained throughout the study.

RESULTS

Table – I: Distribution of baseline characteristics among the participants (*n*=54)

Variables	Frequency	Percentage
Age		
<5yr	26	48.15
5-10yr	20	37.04
>10yrs	8	14.81
Sex		
Male	30	55.56
Female	24	44.44
Dengue History in family		
Yes	13	24.07
No	41	75.93
BMI		
Obese	2	3.70
Overweight	3	5.56
Normal Weight	40	74.07
Underweight	3	5.56
Malnourished	6	11.11
Duration of fever		
<5 days	53	98.15
>5 days	1	1.85

The majority of the children were under the age of 5 years, accounting for 48.15% (26 children), followed by those aged 5-10 years at 37.04% (20 children), and those over 10 years at 14.81% (8 children). The sex distribution showed a slightly higher prevalence of dengue fever among males, with 55.56% (30 children) being male and 44.44% (24 children) being female. Regarding the history of dengue in the family, 24.07% (13 children) reported having a family history of dengue, while 75.93% (41 children) did not have such a history. In terms of nutritional status, the majority of children were of

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normal weight, comprising 74.07% (40 children). A small proportion of the children were classified as obese (3.70%, 2 children) or overweight (5.56%, 3 children). Additionally, 5.56% (3 children) were underweight, and 11.11% (6 children) were malnourished. The duration of fever was less than 5 days for almost all participants, with 98.15% (53 children) having a fever for less than 5 days, and only 1.85% (1 child) having a fever for more than 5 days.

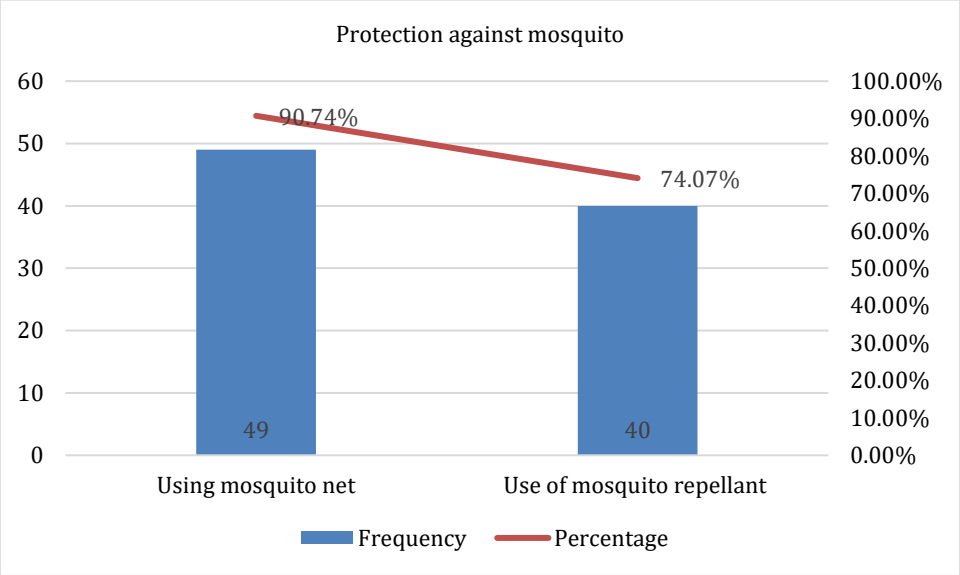

Figure – 1: Distribution of participants by habit of protection against mosquito (*n*=54)

The data indicates that a significant majority of the children, 90.74% (49 children), reported using mosquito nets as a protective measure. Additionally, 74.07% (40 children) used mosquito repellents.

Table – II: Distribution of participants by duration of hospital stay (*n*=54)

Duration of the hospital stay	Frequency	Percentage
3-6 days	28	51.85
7-10days	17	31.48
11-14 days	8	14.81

The majority of the children, 51.85% (28 children), had a hospital stay lasting between 3 to 6 days. Additionally, 31.48% (17 children) were hospitalized for 7 to 10 days, and 14.81% (8 children) had a hospital stay of 11 to 14 days.

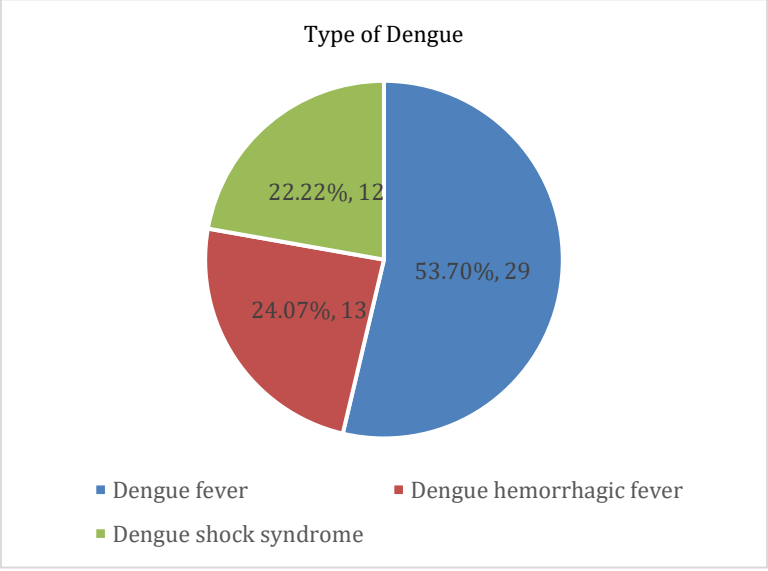

Figure – 2: Distribution of participants by dengue type (*n*=54)

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Among the 54 children diagnosed with dengue, 53.70% (29 children) were diagnosed with dengue fever, making it the most common type. Dengue hemorrhagic fever was observed in 24.07% (13 children) of the participants. Additionally, 22.22% (12 children) were diagnosed with dengue shock syndrome.

Table – III: Distribution of participants presenting complaints and symptoms (*n*=54)

Variable	Frequency	Percentage
Fever	54	100.00
Headache	11	20.37
Retro-orbital pain	7	12.96
Mayalgia/arthralgia/back pain	1	1.85
Nausea	6	11.11
Vomiting	44	81.48
Abdominal pain	19	35.19
Rash	11	20.37
Bleeding from skin	10	18.52
Epistaxis	6	11.11
Gum bleeding	8	14.81
Hematuria	1	1.85
Hematochezia	4	7.41

Fever was a universal symptom, affecting all participants (100.00%). Vomiting was also highly prevalent, reported by 81.48% (44 children). Abdominal pain was noted in 35.19% (19 children), while headache and rash each affected 20.37% (11 children). Bleeding from the skin was observed in 18.52% (10 children), and gum bleeding was reported by 14.81% (8 children). Other symptoms included epistaxis in 11.11% (6 children), nausea in 11.11% (6 children), and retro-orbital pain in 12.96% (7 children). Less common symptoms were hematochezia, present in 7.41% (4 children), myalgia/arthralgia/back pain in 1.85% (1 child), and hematuria in 1.85% (1 child).

Table – IV: Distribution of clinical features among participants

Clinical Features	Frequency	Percentage
Tourniquet test		
Positive	13	24.07
Negative	41	75.93
HB%		
<9.9 gram/dl	12	22.22
10- 10.9gram/dl	5	9.26
>11 gram/dl	37	68.52
Hematocrit range (%)		
<30	12	22.22
30-40	39	72.22
>40	3	5.56
Platelet		
20,000-50,000	5	9.26
50,000-100,000	10	18.52
>100,000	39	72.22
SGPT		
≤40 IU	35	64.81
>40 IU	19	35.19
Serum Creatinine		
<1	41	75.93
≥1	13	24.07
Serum Na+ level (mEq/L)		
<135mEq/L	13	24.07
135-145 mEq/L	37	68.52
>145 mEq/L	4	7.41
Serum K+ level (mEq/L)		
<3.5 mEq/L	12	22.22
3.5-5.5 mEq/L	37	68.52
>5.5 mEq/L	5	9.26
Serum Cl- level		
<96 mEq/L	3	5.56
96-106 mEq/L	29	53.70
>106 mEq/L	22	40.74

The tourniquet test was positive in 24.07% (13 children) and negative in 75.93% (41 children). Hemoglobin (HB) levels showed that 22.22% (12 children) had levels below 9.9 grams per deciliter, 9.26% (5 children) had levels between 10 and 10.9 grams per deciliter, and 68.52% (37 children) had levels above 11 grams per deciliter. Hematocrit levels indicated that 22.22% (12 children) had levels below 30%, 72.22% (39 children) had levels between 30% and 40%, and 5.56% (3 children) had levels above 40%. Platelet counts varied among participants, with 9.26% (5 children) having counts between 20,000 and 50,000, 18.52% (10 children) between 50,000 and 100,000, and 72.22% (39 children) having counts above 100,000. Serum glutamate pyruvate transaminase (SGPT) levels were ≤40 IU in 64.81% (35 children) and >40 IU in 35.19% (19 children). Serum creatinine levels were less than 1 mg/dl in 75.93% (41 children) and ≥1 mg/dl in 24.07% (13 children). Serum sodium (Na+) levels showed that 24.07% (13 children) had levels below 135 mEq/L, 68.52% (37 children) had levels between 135 and 145 mEq/L, and 7.41% (4 children) had levels above 145 mEq/L. Serum potassium (K+) levels indicated that 22.22% (12 children) had levels below 3.5 mEq/L, 68.52% (37 children) had levels between 3.5 and 5.5 mEq/L, and 9.26% (5 children) had levels above 5.5 mEq/L. Lastly, serum chloride (Cl-) levels were below 96 mEq/L in 5.56% (3 children), between 96 and 106 mEq/L in 53.70% (29 children), and above 106 mEq/L in 40.74% (22 children).

DISCUSSION

The current study aimed to investigate the socio-demographic and clinical characteristics of children with dengue fever at the Institute of Child and Mother Health (ICMH) in Bangladesh. Our findings revealed that the majority of the participants were under 5 years of age (48.15%), and males were slightly more affected (55.56%). These observations are consistent with studies from Nicaragua and Santiago de Cuba, which reported a higher prevalence of dengue among young males and children aged 5-9 years [16,17]. The family history of dengue was noted in 24.07% of our cases, emphasizing the role of household-level risk factors in dengue transmission, as supported by studies from Delhi and Brazil[18,19]. Nutritional status plays a significant role in the clinical outcomes of dengue. In our study, most children were of normal weight (74.07%), with small proportions being obese, overweight, underweight, or malnourished. This is in line with findings from Thailand, where normal weight was associated with better outcomes, while malnutrition and obesity were linked to severe dengue[20,21]. The majority of our participants experienced fever for less than 5 days (98.15%), which aligns

with the typical acute phase of dengue reported in Bangkok and other regions[22,23]. Additionally, high usage of mosquito nets (90.74%) and repellents (74.07%) was observed, reflecting effective preventive measures similar to those reported in coastal Ecuador [24]. Hospital stay duration varied, with most children staying for 3-6 days (51.85%). The type of dengue in our cohort included dengue fever (53.70%), dengue hemorrhagic fever (24.07%), and dengue shock syndrome (22.22%), which aligns with the distribution reported in Lahore and Dhaka[25,26]. Clinically, all participants presented with fever, and common symptoms included vomiting (81.48%), abdominal pain (35.19%), headache (20.37%), and rash (20.37%). These findings are consistent with studies in Thailand and Bangladesh, where fever and vomiting were predominant symptoms[27,28]. Bleeding manifestations such as skin bleeding (18.52%), gum bleeding (14.81%), and epistaxis (11.11%) were observed, similar to reports from Islamabad and Indonesia[7,29]. The tourniquet test was positive in 24.07% of cases, reflecting its low sensitivity as noted in studies from India and Vietnam[30,31]. Hemoglobin levels varied, with 22.22% having levels below 9.9 grams per deciliter, consistent with observations in Delhi[32]. Hematocrit levels ranged widely, with the majority (72.22%) between 30% and 40%, supporting findings from the Brazilian Amazon[20]. Platelet counts were predominantly above 100,000/mm3 in 72.22% of cases, aligning with trends reported in Western Rajasthan[21]. Elevated SGPT levels were noted in 35.19% of participants, similar to findings in Delhi[19]. Serum creatinine levels were elevated in 24.07% of cases, supporting findings from the Brazilian Amazon [29]. Electrolyte imbalances were also common, with 24.07% of participants having hyponatremia and 22.22% having hypokalemia, consistent with findings from Delhi and Western Rajasthan [32,33]. Serum chloride levels varied, with 40.74% above 106 mEq/L, reflecting trends in similar studies[32]. In conclusion, our study provides a comprehensive overview of the socio-demographic and clinical characteristics of children with dengue fever in Bangladesh. The findings are consistent with various international studies, highlighting common trends and variations in dengue presentation and management. These insights can aid in the development of targeted interventions and improved management strategies for pediatric dengue patients.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

In conclusion, the present study provides a comprehensive overview of the socio-demographic and clinical characteristics of children with dengue fever in Bangladesh. The findings reveal significant patterns in age and gender distribution, nutritional status, and clinical presentations, highlighting the predominant impact on younger males and the critical role of nutritional status in disease severity. The study also underscores the importance of mosquito protection habits and the commonality of short hospital stays among pediatric dengue patients. The clinical features observed, including frequent fever, vomiting, and various bleeding symptoms, align with international findings, reinforcing the need for vigilant monitoring and timely intervention. These insights can inform public health strategies and clinical management practices to improve outcomes for children affected by dengue fever in Bangladesh.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. *Guzman MG, Harris E. Dengue. The Lancet. 2015 Jan 31;385(9966):453-65.*
2. *Fernandes CI, Perez LE, Perez DE. Uncommon oral manifestations of dengue viral infection. Brazilian Journal of Otorhinolaryngology. 2020 Jan 8;86:s3-5.*
3. *Guzman A, Istúriz RE. Update on the global spread of dengue. International journal of antimicrobial agents. 2010 Nov 1;36:S40-2.*
4. *Gubler DJ, Clark GG. Dengue/dengue hemorrhagic fever: the emergence of a global health problem. Emerging infectious diseases. 1995 Apr;1(2):55.*
5. *Khetarpal N, Khanna I. Dengue fever: causes, complications, and vaccine strategies. Journal of immunology research. 2016;2016(1):6803098.*
6. *Shirin T, Muraduzzaman AK, Alam AN, Sultana S, Siddiqua M, Khan MH, Akram A, Sharif AR, Hossain S, Flora MS. Largest dengue outbreak of the decade with high fatality may be due to reemergence of DEN-3 serotype in Dhaka, Bangladesh, necessitating immediate public health attention. New microbes and new infections. 2019 May;29.*
7. *Yesmin S, Ahammad AM, Sarmin S, Rafi MA, Islam S, Hasan MJ. Clinical profile of pediatric cases of dengue during the 2019 epidemic in Bangladesh: A multicenter cross-sectional study. Mymensingh medical journal: MMJ. 2023 Apr;32(2):502-9.*
8. *Salje H, Paul KK, Paul R, Rodriguez-Barraquer I, Rahman Z, Alam MS, Rahman M, Al-Amin HM, Heffelfinger J, Gurley E. Nationally-representative serostudy of dengue in Bangladesh allows generalizable disease burden estimates. Elife. 2019 Apr 8;8:e42869.*
9. *Zhang J, Shu Y, Shan X, Li D, Ma D, Li T, Long S, Wang X, Pan Y, Chen J, Liu P. Co-circulation of three dengue virus serotypes led to a severe dengue outbreak in Xishuangbanna, a border area of China, Myanmar, and Laos, in 2019. International Journal of Infectious Diseases. 2021 Jun 1;107:15-7.*
10. *Guo C, Zhou Z, Wen Z, Liu Y, Zeng C, Xiao D, Ou M, Han Y, Huang S, Liu D, Ye X. Global epidemiology of dengue outbreaks in 1990–2015: a systematic review and meta-analysis. Frontiers in cellular and infection microbiology. 2017 Jul 12;7:317.*
11. *Mahmood R, Benzadid MS, Weston S, Hossain A, Ahmed T, Mitra DK, Ahmed S. Dengue outbreak 2019: clinical and laboratory profiles of dengue virus infection in Dhaka city. Heliyon. 2021 Jun 1;7(6).*
12. *Sirisena PD, Noordeen F, Fernando L. A preliminary study on clinical profiles of dengue and dengue haemorrhagic fever suspected patients from two hospitals in the Western Province of Sri Lanka. Sri Lankan J Infect Dis. 2014 Oct 29;4(2):99-107.*
13. *Peeling RW, Artsob H, Pelegrino JL, Buchy P, Cardosa MJ, Devi S, Enria DA, Farrar J, Gubler DJ, Guzman MG, Halstead SB. Evaluation of diagnostic tests: dengue. Nature Reviews Microbiology. 2010 Dec;8(Suppl 12):S30-7.*

14. *Chowdhury FR, Yasmeen BN. Clinical profile and outcome of dengue fever in children: In a tertiary care hospital. Northern International Medical College Journal. 2020;12(1):499-502.*
15. *Angel RM, Valle JR. Dengue vaccines: Strongly sought but not a reality just yet. PLoS pathogens. 2013 Oct 3;9(10):e1003551.*
16. *Hammond SN, Balmaseda A, Perez L, Tellez Y, Saborío SI, Mercado JC, Videa E, Rodriguez Y, Perez MA, Cuadra R, Solano S. Differences in dengue severity in infants, children, and adults in a 3-year hospital-based study in Nicaragua. American Journal of Tropical Medicine and Hygiene. 2005 Dec 1;73(6):1063-70.*
17. *Orozco Hechavarría N, Díaz Portuondo IM, Abad Cañete U, Martínez Delgado Y. [Incidence of dengue in children and adolescents]. Rev Cubana Med Trop. 2001;53(1):16–9.*
18. *Sharma Y, Kaur M, Singh S, Pant L, Kudesia M, Jain S. Seroprevalence and trend of dengue cases admitted to a government hospital, Delhi–5-year study (2006-2010): a look into the age shift. International journal of preventive medicine. 2012 Aug;3(8):537.*
19. *Braga C, Luna CF, Martelli CM, De Souza WV, Cordeiro MT, Alexander N, Júnior JC, Marques ET. Seroprevalence and risk factors for dengue infection in socio-economically distinct areas of Recife, Brazil. Acta tropica. 2010 Mar 1;113(3):234-40.*
20. *Te H, Sriburin P, Rattanamahaphoom J, Sittikul P, Hattasingh W, Chatchen S, Sirinam S, Limkittikul K. Association between nutritional status and dengue severity in Thai children and adolescents. PLOS Neglected Tropical Diseases. 2022 May 19;16(5):e0010398.*
21. *Kalayanarooj S, Nimmannitya S. Is dengue severity related to nutritional status. Southeast Asian J Trop Med Public Health. 2005 Mar 1;36(2):378-84.*
22. *Talari SR, Belavadi G. A clinical and biochemical laboratory profile to measure the severity of dengue fever in paediatric population and their outcome. International Journal of Contemporary Pediatrics. 2021 Feb 23;8(3):535–40.*
23. *Hanafusa S, Chanyasanha C, Sujirarat D, Khuankhunsathid I, Yaguchi A, Suzuki T. Clinical features and differences between child and adult dengue infections in Rayong Province, southeast Thailand.*
24. *Chang A, Finkelstein J, Cárdenas W, Leal MZ, Velasquez JA, Asinc JC, Tablante EC, Colt S, Erickson D, Mehta S. Malnutrition and Suspected Dengue Virus Infection in Children in Coastal Ecuador (P10-120-19). Current Developments in Nutrition. 2019 Jun 1;3:nzz034-P10.*
25. *Humayoun MA, Waseem T, Jawa AA, Hashmi MS, Akram J. Multiple dengue serotypes and high frequency of dengue hemorrhagic fever at two tertiary care hospitals in Lahore during the 2008 dengue virus outbreak in Punjab, Pakistan. International Journal of Infectious Diseases. 2010 Sep 1;14:e54-9.*
26. *Mutanabbi M, Shova SS, Kibtiar M, Mosleh T. Clinical Profile and Lab Findings of Dengue Fever in Children Admitted in a Tertiary Care Hospital. Mymensingh Medical Journal: MMJ. 2022 Jul 1;31(3):741-8.*
27. *Ahmed KA, Shams N, Naseer MA, Ahmad HM. Spectrum of complicated dengue fever in Rawal Institute of Health Sciences Islamabad: a cross sectional study. Journal of University Medical & Dental College. 2020 Dec 16;11(4):25-32.*
28. *Richards AL, Bagus R, Baso SM, Follows GA, Tan R, Graham RR, Sandjaja B, Corwin AL, Punjabi N. The first reported outbreak of dengue hemorrhagic fever in Irian Jaya, Indonesia. The American journal of tropical medicine and hygiene. 1997 Jul 1;57(1):49-55.*
29. *Mourão MP, Lacerda MV, Macedo VO, Mourão MP, Lacerda MV, Macedo VO, Santos JB. Thrombocytopenia in patients with dengue virus infection in the Brazilian Amazon. Platelets. 2007 Jan 1;18(8):605-12.*
30. *Gomber S, Ramachandran VG, Kumar S, Agarwal KN, Gupta P, Dewan DK. Hematological observations as diagnostic markers in dengue hemorrhagic fever--a reappraisal. Indian pediatrics. 2001 May 1;38(5):477-81.*
31. *Phuong CX, Nhan NT, Wills B, Kneen R, Ha NT, Mai TT, Huynh TT, Lien DT, Solomon T, Simpson JA, White NJ. Evaluation of the World Health Organization standard tourniquet test and a modified tourniquet test in the diagnosis of dengue infection in Viet Nam. Tropical Medicine & International Health. 2002 Feb;7(2):125-32.*
32. *Faridi MM, Aggarwal A, Kumar M, Sarafrazul A. Clinical and biochemical profile of dengue haemorrhagic fever in children in Delhi. Tropical doctor. 2008 Jan;38(1):28-30.*
33. *Makwana M, Kumari S, Mourya HK, Mitharwal R, Ram S. A study to find out the relationship between various platelet indices and morbidity profile of dengue fever in pediatric patients on admission in Western Rajasthan, India. India. Pediatr Infect Dis. 2020 Apr;2(2):44.*