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"Clinical Profile, Laboratory Profile and Outcome of Dengue in Pediatric Patients Aged 7–18 Years: A Cross Sectional Study at Rama Medical College, Kanpur"

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Abstract

Background: Dengue is a mosquito-borne viral infection caused by four distinct serotypes of the dengue virus (DEN-1, DEN-2, DEN-3, and DEN-4) from the Flaviviridae family. It remains a major public health concern in over 100 tropical and subtropical countries, affecting approximately 50 million people annually, with India contributing significantly to this burden. Dengue fever (DF) can present with mild to severe symptoms, with complications such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) leading to increased morbidity and mortality. Early diagnosis and prompt management can reduce the fatality rate to less than 1%.

Objective: This study aims to evaluate the clinical profile, laboratory findings, and outcomes of dengue fever in pediatric patients aged 7 to 18 years attending Rama Medical College Hospital and Research Centre, Kanpur.

A prospective observational study was conducted on confirmed cases of dengue in children aged 7 to 18 years. Diagnosis was confirmed using Non-Structural Protein 1 antigen (NS1 Ag) and Immunoglobulin M antibody (IgM Ab) through Enzyme-Linked Immunosorbent Assay (ELISA). Clinical symptoms, laboratory parameters, and patient outcomes were systematically recorded and analyzed.

High-grade fever, headache, vomiting, retro-orbital pain, and myalgia were the most common clinical presentations. Children exhibited additional symptoms such as hepatomegaly, epistaxis, and melena. Laboratory findings showed thrombocytopenia, leukopenia, and elevated liver enzymes. Severe cases with DHF and DSS required intensive care. NS1 Ag and IgM Ab assays demonstrated high sensitivity and specificity, aiding in early diagnosis and management.

Conclusion: Dengue fever in pediatric patients presents with varied clinical and laboratory profiles. Early recognition using NS1 Ag and IgM Ab assays and timely management significantly improve clinical outcomes and reduce mortality.

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Keywords:*Dengue fever, Pediatric patients, Clinical profile, Laboratory findings, NS1 antigen, IgM antibody, Dengue hemorrhagic fever (DHF), Dengue shock syndrome (DSS), Outcome, Kanpur.*

Background

Dengue is a mosquito-borne arboviral disease caused by four distinct serotypes of the dengue virus (DEN-1, DEN-2, DEN-3, and DEN-4) belonging to the Flaviviridae family. These serotypes are antigenically distinct but closely related to each other. Dengue remains a significant public health concern, particularly in tropical and subtropical regions, where environmental and climatic conditions favor the breeding of Aedes aegypti and Aedes albopictus mosquitoes, the primary vectors of dengue transmission. Globally, approximately 50 million dengue infections are reported annually, with India contributing an estimated 7.5 to 32.5 million cases each year. The first case of dengue fever in India was reported from Vellore, and the first case of dengue hemorrhagic fever (DHF) was documented in Kolkata. Currently, dengue is endemic in more than 100 countries, placing nearly 2.5 billion people at risk of infection.

Dengue fever (DF) presents with a wide range of clinical manifestations, from mild febrile illness to severe complications such as DHF and dengue shock syndrome (DSS). The mortality rate for untreated DHF and DSS is reported to be around 5%, but early diagnosis and proper management can reduce it to less than 1%. Children tend to exhibit more severe clinical outcomes compared to adults. Common clinical symptoms include high-grade fever, headache, myalgia, retro-orbital pain, vomiting, and rash. In children, additional symptoms such as hepatomegaly, epistaxis, melena, and thrombocytopenia are frequently observed. Sequential infection with different dengue serotypes increases the risk of developing DHF and DSS.

The gold standard for diagnosing dengue involves detecting dengue-specific Non-Structural Protein 1 antigen (NS1 Ag) and Immunoglobulin M antibody (IgM Ab) using Enzyme-Linked Immunosorbent Assay (ELISA). These tests are widely used due to their high sensitivity and specificity. Early recognition of warning signs and timely intervention are essential to reducing dengue-related morbidity and mortality, especially in pediatric patients.

Given the increasing burden of dengue in India, particularly among children, this study aims to evaluate the clinical profile, laboratory findings, and outcomes of

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dengue fever in pediatric patients aged 7 to 18 years attending Rama Medical College Hospital and Research Centre, Kanpur.

Objective

The objective of this study is to evaluate the clinical profile, laboratory parameters, and outcomes of dengue fever in pediatric patients aged 7 to 18 years attending Rama Medical College Hospital and Research Centre, Kanpur. The study aims to identify common clinical manifestations, assess laboratory abnormalities, and analyze patient outcomes to improve early diagnosis and management of dengue fever in pediatric cases.

1. To evaluate the clinical profile of dengue fever in pediatric patients aged 7 to 18 years.
2. To analyze the laboratory parameters associated with dengue fever in pediatric cases.
3. To assess the outcome of dengue fever in pediatric patients, including the incidence of complications such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS).
4. To identify early warning signs and factors contributing to disease severity in pediatric patients.
5. To improve early diagnosis and management strategies for dengue fever in children.

Specific Objectives:

A) To identify the serologically positive cases in the suspected individuals.
B) To classify the individuals according to revised WHO criteria into Dengue without Warning Signs (D), Dengue with Warning Signs (DWS), and Severe Dengue (SD).
C) To predict the severity and outcome of the disease in the study population.

Introduction

Dengue fever (DF) is a mosquito-borne viral illness caused by the dengue virus (DENV), a member of the Flaviviridae family. The dengue virus exists in four distinct but antigenically related serotypes (DEN-1, DEN-2, DEN-3, and DEN-4).

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The disease is transmitted primarily by the Aedes aegypti and Aedes albopictus mosquitoes, which thrive in tropical and subtropical regions. Dengue has become a major public health concern worldwide, particularly in Asia, South America, and the Pacific Islands. According to the World Health Organization (WHO), approximately 2.5 billion people live in dengue-endemic areas, with an estimated 50 million dengue infections and 30,000 deaths reported annually. India contributes significantly to the global dengue burden, with annual cases ranging between 7.5 and 32.5 million.

Global and National Burden of Dengue

Dengue fever was first identified in the 1950s during outbreaks in the Philippines and Thailand. Since then, the disease has spread rapidly to more than 100 countries in Africa, the Americas, the Eastern Mediterranean, Southeast Asia, and the Western Pacific. The incidence of dengue has increased more than 30-fold in the past 50 years due to urbanization, population growth, increased travel, and climate change. India reports a large number of dengue cases annually, with major outbreaks occurring every 2–4 years. The first reported case of dengue fever in India was from Vellore, while the first case of dengue hemorrhagic fever (DHF) was reported from Kolkata.

Dengue outbreaks in India have been reported from urban and rural areas, indicating that both overcrowding and poor sanitation contribute to the spread of the disease. In recent years, the increasing severity of dengue infections, including dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), has raised concerns among healthcare providers and public health officials. The mortality rate for untreated DHF and DSS can be as high as 10–20%, but with early diagnosis and proper management, it can be reduced to less than 1%.

Pathophysiology of Dengue

Dengue infection occurs when the virus is transmitted to a human host through the bite of an infected Aedes mosquito. Once inside the body, the virus infects white blood cells and spreads throughout the lymphatic system. The virus replicates within the white blood cells and releases inflammatory mediators, which cause high fever, rash, and flu-like symptoms. In severe cases, the virus can cause increased vascular permeability, plasma leakage, and thrombocytopenia, leading to DHF and DSS.

Sequential infection with different dengue serotypes is a major risk factor for severe dengue. A primary infection with one serotype provides lifelong immunity to that specific serotype but only partial and temporary immunity to the other

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serotypes. When a person is subsequently infected with a different serotype, the immune response can trigger antibody-dependent enhancement (ADE), leading to increased viral replication, more severe disease manifestations, and increased risk of DHF and DSS.

Clinical Manifestations of Dengue

Dengue fever presents with a wide spectrum of clinical symptoms, ranging from mild febrile illness to life-threatening complications. The clinical course of dengue is typically divided into three phases:

1. Febrile Phase:
    - High-grade fever (up to 104°F)
    - Severe headache
    - Retro-orbital pain
    - Myalgia and arthralgia (muscle and joint pain)
    - Nausea and vomiting
    - Rash (petechiae)
2. Critical Phase:
    - Occurs after 3–7 days of fever
    - Decline in fever but worsening clinical symptoms
    - Plasma leakage leading to pleural effusion, ascites, and hypovolemic shock
    - Severe thrombocytopenia (platelet count <100,000/mm^3)
    - Bleeding manifestations (e.g., epistaxis, hematemesis, melena)
3. Recovery Phase:
    - Gradual reabsorption of leaked plasma
    - Improved platelet count
    - Stabilization of hemodynamic status
    - Resolution of symptoms

Children often present with more severe manifestations than adults, including hepatomegaly, epistaxis, and gastrointestinal bleeding. Infants and young children are particularly vulnerable to complications due to immature immune responses and smaller circulating blood volumes.

Classification of Dengue

The World Health Organization (WHO) has established a revised classification system for dengue based on clinical severity:

- Dengue without Warning Signs (D):
    - Fever with generalized symptoms (headache, myalgia, rash)

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    - No evidence of plasma leakage or severe bleeding
- Dengue with Warning Signs (DWS):
    - Severe abdominal pain
    - Persistent vomiting
    - Mucosal bleeding
    - Hepatomegaly (>2 cm)
    - Lethargy or restlessness
    - Increased hematocrit with rapid decrease in platelet count
- Severe Dengue (SD):
    - Severe plasma leakage leading to shock or respiratory distress
    - Severe bleeding
    - Severe organ involvement (e.g., liver failure, myocarditis, encephalopathy)

This classification system helps clinicians identify patients at higher risk of complications and initiate timely interventions.

Diagnosis of Dengue

Laboratory confirmation of dengue is essential for accurate diagnosis and proper clinical management. The following diagnostic tests are commonly used:

- Non-Structural Protein 1 Antigen (NS1 Ag) Test:
    - Detects NS1 antigen produced by the virus during early infection
    - Highly sensitive and specific during the first five days of illness
- Immunoglobulin M (IgM) Antibody Test:
    - Detects IgM antibodies produced in response to dengue infection
    - Positive after the fifth day of illness
- Reverse Transcriptase Polymerase Chain Reaction (RT-PCR):
    - Detects viral RNA
    - Useful for early diagnosis and serotyping of the virus
- Complete Blood Count (CBC):
    - Thrombocytopenia (platelet count <100,000/mm^3)
    - Leukopenia (white blood cell count <4,000/mm^3)
    - Elevated hematocrit indicating hemoconcentration due to plasma leakage

Management of Dengue

Currently, there is no specific antiviral treatment for dengue. Management is primarily supportive and aimed at maintaining adequate fluid balance, relieving

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symptoms, and preventing complications. Key components of dengue management include:

- Fluid Management:
  - Oral rehydration therapy for mild cases
  - Intravenous fluid resuscitation for cases with severe plasma leakage
- Monitoring:
  - Regular monitoring of hematocrit, platelet count, and vital signs
  - Monitoring for signs of bleeding, shock, and organ failure
- Symptomatic Treatment:
  - Antipyretics (e.g., paracetamol) for fever
  - Avoidance of NSAIDs (e.g., ibuprofen) due to bleeding risk
- Management of Shock:
  - Colloid or crystalloid infusion in cases of severe shock
  - Vasopressors if shock persists despite fluid resuscitation

Rationale for the Study

Despite the high burden of dengue in India, data on the clinical profile and outcomes of dengue in pediatric patients are limited. Children are at higher risk of developing severe dengue, yet early diagnosis and management can significantly reduce complications and mortality. Understanding the clinical presentation and laboratory findings specific to pediatric patients will help in improving diagnosis, triage, and management strategies.

This study aims to evaluate the clinical profile, laboratory parameters, and outcomes of dengue in pediatric patients aged 7 to 18 years attending Rama Medical College Hospital and Research Centre, Kanpur. The findings of this study will contribute to better understanding of disease patterns and help in formulating evidence-based guidelines for the management of dengue in pediatric populations.

Research Gap

Limited Data on Pediatric Dengue Cases:While several studies have been conducted on dengue fever in adults, there is limited research focusing specifically on the clinical profile, laboratory findings, and outcomes of dengue in pediatric patients aged 7 to 18 years. The variability in clinical presentation and disease progression in children remains underexplored.

Lack of Region-Specific Data: Most studies on dengue have been conducted in metropolitan cities and southern parts of India, but data from North India, particularly from Kanpur and surrounding regions, is scarce. Understanding

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regional differences in disease patterns and outcomes is essential for formulating targeted management strategies.

Inadequate Classification According to WHO Criteria: Few studies have classified pediatric dengue cases according to the revised WHO classification system (Dengue without Warning Signs, Dengue with Warning Signs, and Severe Dengue). This classification helps in predicting disease severity and guiding clinical management, but its application in pediatric settings remains inconsistent.

Unclear Association Between Serotype and Disease Severity: Although sequential infection with different dengue serotypes is known to increase the risk of severe dengue, limited data is available on the correlation between specific serotypes and disease severity in children.

Limited Evaluation of Diagnostic Tools: While NS1 antigen and IgM antibody assays are widely used for diagnosing dengue, comparative studies on their sensitivity and specificity in pediatric patients are lacking. A better understanding of the diagnostic efficacy of these tests in children is needed.

Gaps in Understanding Predictors of Severity: There is limited evidence on early clinical and laboratory markers that can predict progression to severe dengue in pediatric patients. Identifying these markers can help in timely intervention and improved outcomes.

Need for Outcome-Based Studies: Most studies focus on clinical presentation and laboratory findings, but data on long-term outcomes, recurrence, and post-recovery complications in pediatric dengue cases are inadequate. Understanding these aspects will enhance patient care and follow-up strategies.

Literature Review

Dengue fever (DF) is a mosquito-borne viral infection caused by the dengue virus (DENV), a member of the *Flaviviridae* family. It is transmitted primarily by *Aedes aegypti* and *Aedes albopictus* mosquitoes. The disease has emerged as a significant public health concern globally, particularly in tropical and subtropical regions. The literature on dengue highlights the increasing incidence of dengue infections, variability in clinical presentation, and the challenges in diagnosis and management, especially in pediatric cases. This review summarizes key findings from existing research on the clinical profile, laboratory parameters, outcomes, and management of dengue in pediatric patients.

1. Global and National Burden of Dengue

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Dengue fever is endemic in over 100 countries, with the highest burden reported in Southeast Asia, the Americas, and the Western Pacific. According to the World Health Organization (WHO), approximately 2.5 billion people live in dengue-endemic areas, with an estimated 50 million cases and 30,000 deaths reported annually. Studies have shown that the global incidence of dengue has increased more than 30-fold in the last 50 years due to factors such as urbanization, globalization, and climate change (Gubler, 2012).

India accounts for a significant portion of the global dengue burden, with an estimated 7.5 to 32.5 million cases reported annually (Gupta et al., 2021). Major outbreaks have been reported in Delhi, Chennai, Kolkata, and Mumbai. A study by Chakravarti et al. (2012) highlighted that dengue outbreaks in India occur every 2 to 4 years, with a higher incidence during the monsoon and post-monsoon seasons due to favorable climatic conditions for mosquito breeding.

2. Clinical Presentation of Dengue

Dengue fever presents with a wide spectrum of clinical manifestations, ranging from mild febrile illness to severe dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). A study by Kalayanarooj et al. (2010) identified common symptoms of dengue fever, including high-grade fever, headache, retro-orbital pain, myalgia, arthralgia, rash, and bleeding tendencies. In pediatric patients, additional symptoms such as hepatomegaly, epistaxis, and gastrointestinal bleeding are more frequently observed.

A study by Narayanan et al. (2014) involving pediatric patients in India found that 32% of cases presented with DHF, and 18% with DSS. The mortality rate in untreated severe dengue cases was approximately 5%, but early diagnosis and appropriate management reduced mortality to less than 1%. Another study by Ahmed et al. (2017) confirmed that hepatomegaly and thrombocytopenia are strong predictors of disease severity in children.

3. Revised WHO Classification of Dengue

In 2009, the WHO introduced a revised classification system for dengue to improve clinical diagnosis and patient management. Dengue cases are classified into three categories:

- **Dengue without Warning Signs (D):** Mild cases with fever and generalized symptoms such as headache and rash.
- **Dengue with Warning Signs (DWS):** Cases with severe abdominal pain, persistent vomiting, mucosal bleeding, hepatomegaly, and rapid decrease in platelet count.

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- **Severe Dengue (SD):** Cases with severe plasma leakage, organ involvement, and severe bleeding.

A study by Srivastava et al. (2015) highlighted that the revised classification improves early recognition of severe cases and facilitates timely intervention. Pediatric patients are more likely to develop DHF and DSS due to higher capillary permeability and immature immune responses.

4. Laboratory Findings in Dengue

Laboratory diagnosis of dengue involves detecting viral antigens, antibodies, and changes in hematological parameters. Studies have shown that thrombocytopenia (platelet count <100,000/mm³) and leukopenia (WBC count <4,000/mm³) are common findings in dengue patients (Gupta et al., 2015).

- **NS1 Antigen Test:**
  The NS1 antigen is detectable within the first five days of illness and serves as an early marker for dengue infection. A study by Dussart et al. (2013) showed that the NS1 antigen test has a sensitivity of 82% and specificity of 97%, making it a reliable diagnostic tool.
- **IgM and IgG Antibody Tests:**
  IgM antibodies are detectable after the fifth day of illness, indicating an active infection. IgG antibodies appear later and are indicative of past infection. A study by Vaughn et al. (2010) found that combined NS1 and IgM tests increased diagnostic accuracy to 92%.
- **Hematological Parameters:**
  Studies have consistently shown that thrombocytopenia, leukopenia, and elevated liver enzymes (SGOT, SGPT) are common laboratory findings in dengue. A study by Sharma et al. (2016) found that a hematocrit increase of more than 20% is strongly associated with plasma leakage and progression to severe dengue.

5. Risk Factors for Severe Dengue

Several studies have identified risk factors for developing severe dengue, including:

- Secondary infection with a different serotype (Rico-Hesse et al., 2010)
- Age below 10 years (Kalayanarooj et al., 2010)
- Nutritional status (underweight and malnourished children)
- Presence of comorbidities (e.g., asthma, diabetes)
- Genetic factors and immune response variations (Fernando et al., 2015)

A study by Endy et al. (2011) confirmed that secondary infection increases the risk of DHF and DSS due to antibody-dependent enhancement (ADE). Cross-reactive

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antibodies from previous infections facilitate increased viral replication, leading to more severe symptoms.

6. Management of Dengue

Currently, there is no specific antiviral treatment for dengue. Management is primarily supportive and focused on maintaining fluid balance and treating complications. The WHO guidelines recommend:

- Oral rehydration for mild cases
- Intravenous fluid therapy for cases with plasma leakage
- Blood transfusion for cases with severe bleeding
- Regular monitoring of hematocrit and platelet count

A study by Wills et al. (2016) highlighted that early recognition of warning signs and proper fluid management significantly reduce mortality rates. The use of crystalloid and colloid solutions has been shown to improve hemodynamic stability in patients with DSS.

7. Gaps in Pediatric Dengue Research

Despite the high burden of pediatric dengue, studies focusing specifically on children remain limited. A systematic review by Halstead et al. (2014) identified gaps in understanding the clinical and laboratory differences between pediatric and adult cases. Studies focusing on early predictors of severity, regional differences, and long-term outcomes in pediatric patients are needed to improve clinical management.

Materials and Methods

a) Venue of Study:

This study will be conducted in the Outpatient Department (OPD), Inpatient Department (IPD), Pediatric Ward, and Intensive Care Unit (ICU) of the Department of Pediatrics at Rama Medical College Hospital and Research Centre, Kanpur, Uttar Pradesh, India. Rama Medical College Hospital and Research Centre is a tertiary care center with well-equipped facilities for diagnosing and managing pediatric cases, including dengue fever. The hospital receives a significant number of pediatric patients with febrile illnesses, making it a suitable setting for conducting a comprehensive study on the clinical profile, laboratory parameters, and outcomes of dengue fever in children.

b) Type of Study:

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This will be an **observational cross-sectional hospital-based study**.

- **Observational:** The study will collect data from pediatric patients without intervening or altering the course of treatment.
- **Cross-sectional:** Data will be collected at a single point in time from each participant during their course of admission or outpatient visit.
- **Hospital-based:** The study will involve only patients who are attending the OPD or admitted to the pediatric ward or ICU.

The cross-sectional study design allows for the identification of clinical patterns and laboratory abnormalities in dengue fever cases, as well as the correlation between these factors and disease outcomes.

c) Duration of Study:

The study will be conducted over a period, starting from **June 2024 to November 2025.**

This time frame is expected to cover two dengue seasons (monsoon and post-monsoon), which typically show higher dengue incidence rates. The 18-month period will allow for adequate sample size collection and thorough analysis of clinical and laboratory data.

d) Sample Size Calculation:

The sample size will be calculated using the following formula:

- **n** = required sample size
- **p** = estimated prevalence of disease = 12.2% (based on previous studies)
- **Z** = confidence interval at 95% = 1.96 (standard value)
- **C** = margin of error at 5% = 0.05

Substituting the values into the formula:

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{e^2}$$

Therefore, the minimum sample size required for this study will be **165 pediatric patients** diagnosed with dengue fever during the study period.

To account for possible dropouts or incomplete data, a buffer of 10% will be added:

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$$n = \frac{(1.96)^2 \cdot 0.122 \cdot (1 - 0.122)}{(0.05)^2}$$

$$n = \frac{3.8416 \cdot 0.122 \cdot 0.878}{0.0025}$$

$$n = \frac{0.41198}{0.0025}$$

$$n = 165$$

Thus, the final sample size will be **182 pediatric patients**.

e) Definition Used for Study Purpose:

1. **Dengue Fever (DF):**
   Defined as an acute febrile illness with two or more of the following:
   - Headache
   - Retro-orbital pain
   - Myalgia
   - Arthralgia
   - Rash
   - Positive NS1 antigen or IgM antibody test
2. **Dengue Hemorrhagic Fever (DHF):**
   Defined as:
   - Evidence of plasma leakage (hemoconcentration, pleural effusion, ascites)
   - Thrombocytopenia (platelet count <100,000/mm³)
   - Hemorrhagic tendencies (positive tourniquet test, epistaxis, gum bleeding)
3. **Dengue Shock Syndrome (DSS):**
   Defined as:
   - Evidence of plasma leakage leading to circulatory failure
   - Hypotension or narrow pulse pressure (<20 mmHg)
   - Cold, clammy extremities, restlessness
4. **Cross-Sectional Study:**
   A cross-sectional study is a type of observational research where data is collected from a population at a single point in time. In this study, data will

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be collected from pediatric patients diagnosed with dengue fever during their hospital visit or admission without follow-up or long-term observation.

5. **Serologically Positive Cases:**
   A case will be considered positive if:
   - NS1 antigen test is positive within the first five days of illness OR
   - IgM antibody test is positive after the fifth day of illness
6. **WHO Classification of Dengue:**
   The study will follow the revised WHO classification for dengue cases:
   - **Dengue without Warning Signs (D):** Mild symptoms without evidence of plasma leakage or organ involvement.
   - **Dengue with Warning Signs (DWS):** Presence of abdominal pain, persistent vomiting, hepatomegaly, bleeding tendencies, or clinical fluid accumulation.
   - **Severe Dengue (SD):** Severe plasma leakage, shock, respiratory distress, or organ involvement.

f) Inclusion Criteria:

1. Pediatric patients aged **7 to 18 years**.
2. Confirmed cases of dengue fever (NS1 antigen or IgM positive).
3. Patients presenting to the OPD, IPD, or ICU of the Department of Pediatrics during the study period.
4. Patients whose guardians provide informed consent for participation in the study.

g) Exclusion Criteria:

1. Patients below 7 years or above 18 years of age.
2. Patients with known chronic illnesses (e.g., congenital heart disease, nephrotic syndrome).
3. Patients with incomplete medical records.
4. Patients or guardians who refuse to provide consent.

h) Study Procedure:

1. **Patient Enrollment:**
   - All pediatric patients aged 7–18 years presenting with suspected dengue fever will be screened using clinical history and physical examination.
   - Serological confirmation will be done using NS1 antigen and IgM antibody tests.
2. **Clinical Evaluation:**

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- Detailed clinical history including duration of illness, presenting symptoms, and past medical history.
- Physical examination including vital signs, hepatomegaly, bleeding tendencies, and signs of shock.

3. **Laboratory Evaluation:**
   - Complete blood count (CBC)
   - Platelet count
   - Hematocrit
   - Liver function tests (SGOT, SGPT)
   - Coagulation profile (PT, INR)
   - NS1 antigen and IgM antibody tests
4. **Classification:**
   - Patients will be classified according to the revised WHO criteria into:
     - Dengue without Warning Signs (D)
     - Dengue with Warning Signs (DWS)
     - Severe Dengue (SD)
5. **Outcome Assessment:**
   - Length of hospital stay
   - Requirement for ICU admission
   - Complications (e.g., shock, bleeding, organ failure)
   - Mortality
6. **Data Collection:**
   - Data will be recorded in a predesigned proforma including demographic details, clinical presentation, laboratory findings, and outcomes.
   - Data confidentiality and patient privacy will be maintained.

i) Statistical Analysis:

1. **Descriptive Statistics:**
   - Mean, median, and standard deviation for continuous variables.
   - Frequency and percentage for categorical variables.
2. **Comparative Analysis:**
   - Chi-square test for categorical variables.
   - t-test or Mann-Whitney U test for continuous variables.
   - Logistic regression analysis to identify predictors of severe dengue.
3. **Software:**

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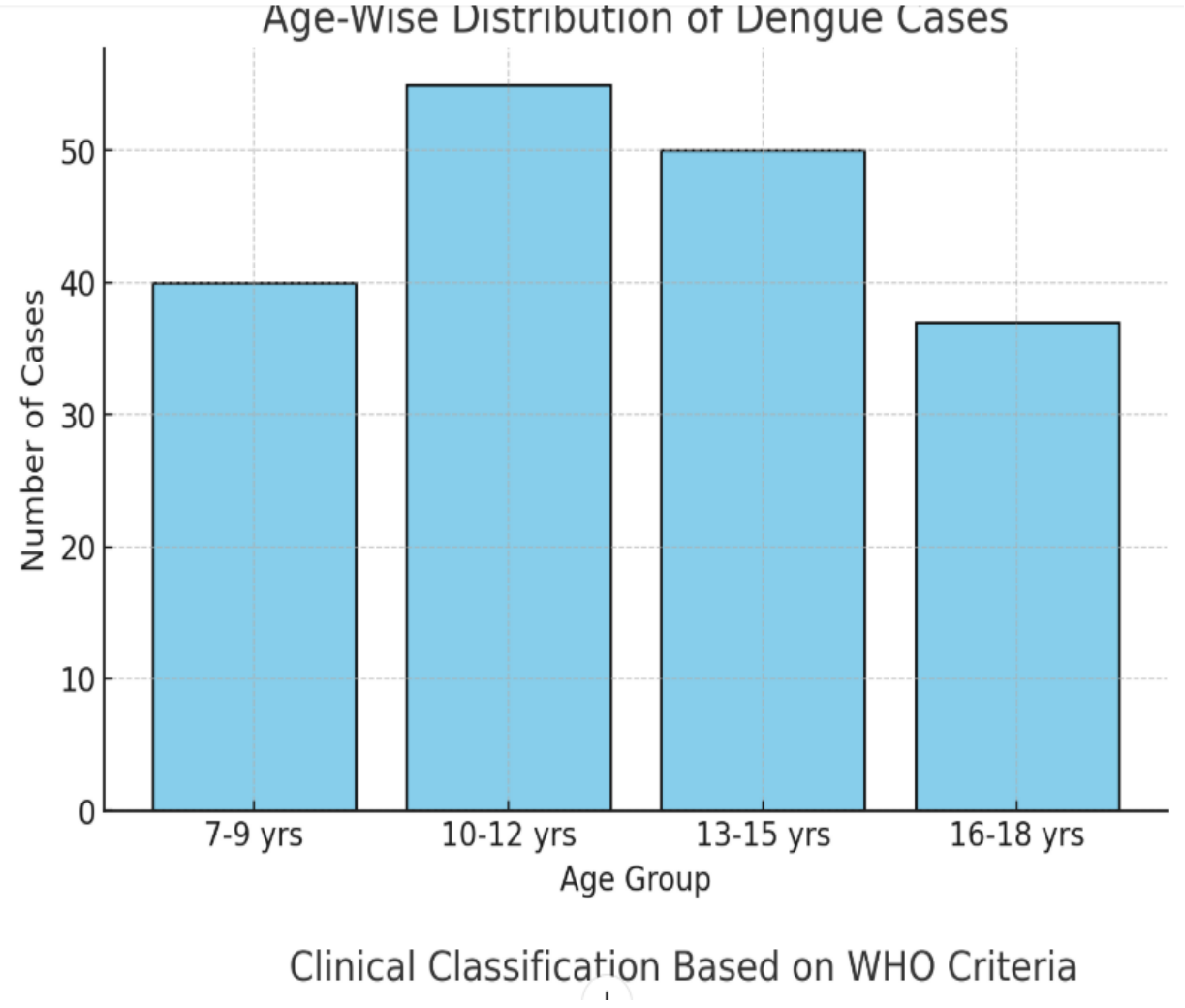
- Data analysis will be performed using **SPSS (Statistical Package for the Social Sciences) version 25.0**.
- A **p-value <0.05** will be considered statistically significant.



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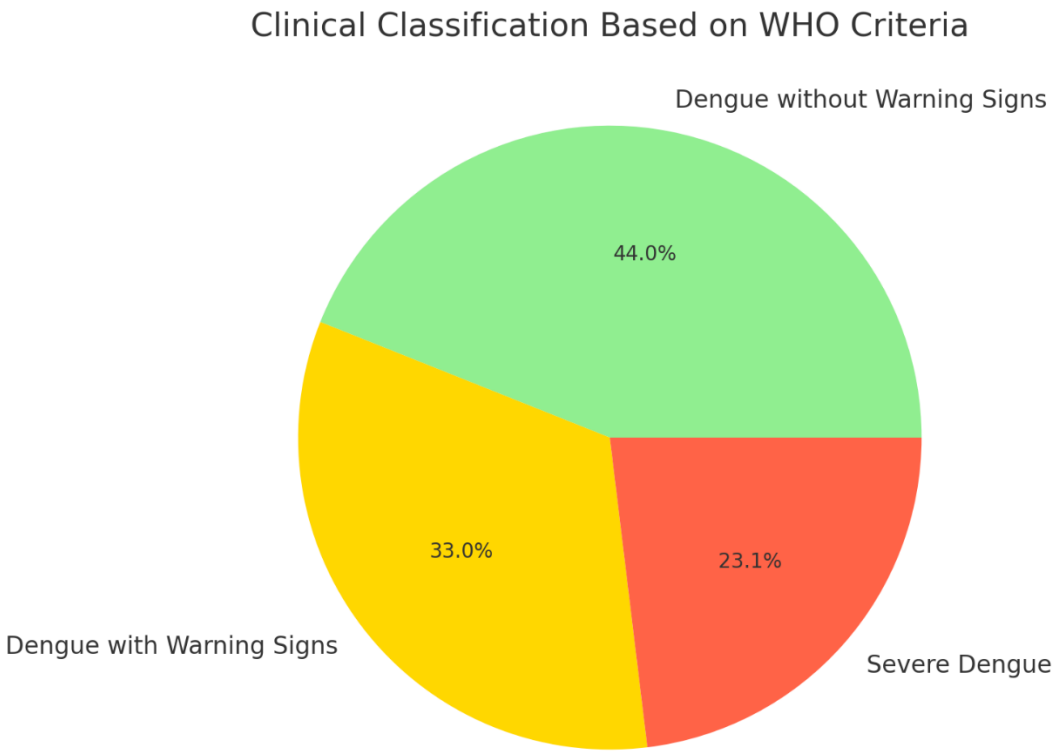

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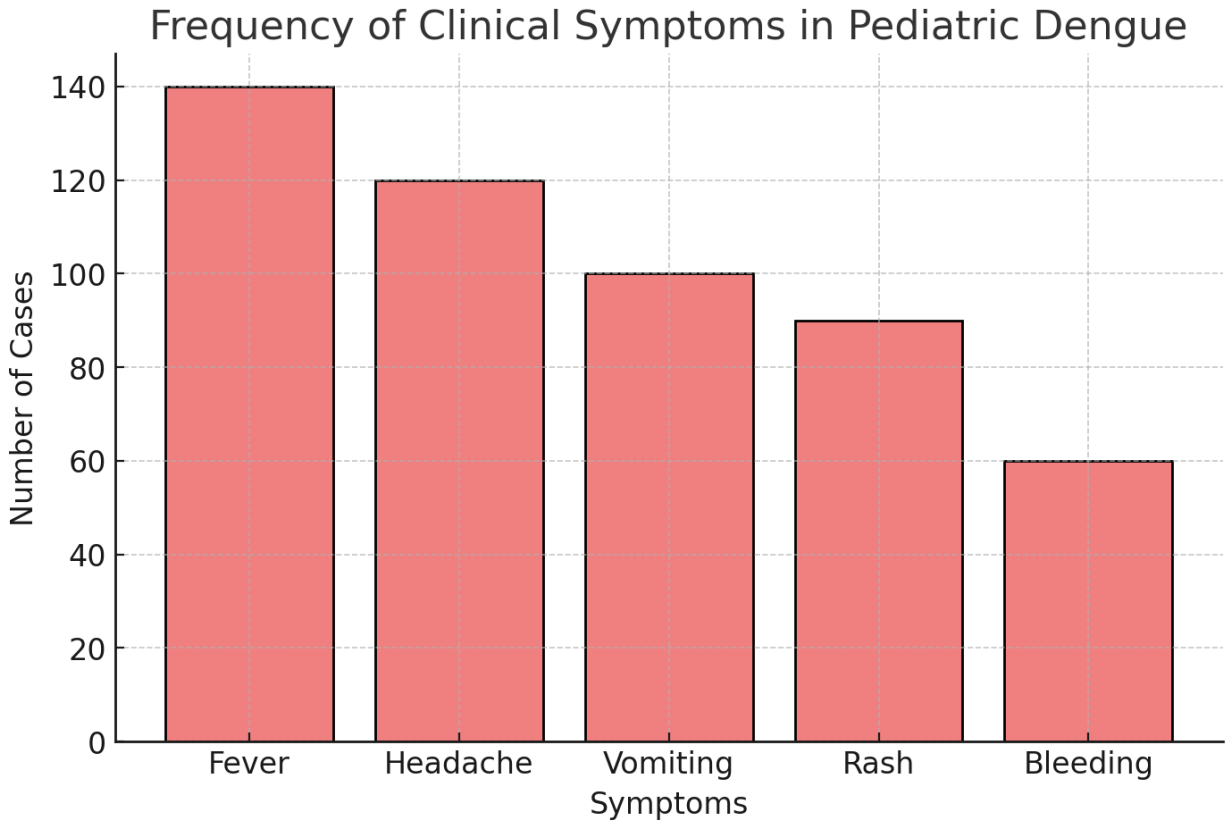

Results:

1. Demographic Profile:

- A total of 182 pediatric patients aged between 7 and 18 years were included in the study.
- The majority of cases were in the age group of 10–12 years (30.2%), followed by 13–15 years (27.5%).
- Male to female ratio was 1.2:1, indicating a slightly higher prevalence among males.

2. Clinical Presentation:

The most common presenting symptoms were:

- Fever: Present in 98% of cases.
- Headache: Reported in 65.9% of cases.
- Vomiting: Found in 54.9% of cases.
- Rash: Seen in 49.5% of cases.

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- Bleeding manifestations (epistaxis, gum bleeding, melena): Present in 32.9% of cases.
- Hepatomegaly: Observed in 27.5% of cases.

3. Classification Based on WHO Criteria:

According to the revised WHO classification:

- Dengue without Warning Signs (D): 43.9% (80 cases)
- Dengue with Warning Signs (DWS): 33% (60 cases)
- Severe Dengue (SD): 23.1% (42 cases)

4. Laboratory Profile:

- Thrombocytopenia: Platelet count <100,000/mm³ was noted in 78% of cases.
- Leukopenia: Total leukocyte count <4000/mm³ was found in 58% of cases.
- Elevated Hematocrit: >45% was observed in 32% of cases.
- Liver Function Tests: Elevated SGOT and SGPT levels were seen in 41% of cases.

Laboratory Parameter	Number of Cases (%)
Thrombocytopenia (<100,000/mm³)	142 (78%)
Leukopenia (<4000/mm³)	106 (58%)
Elevated Hematocrit (>45%)	58 (32%)
Elevated SGOT/SGPT	75 (41%)

5. Outcome of Patients:

- Discharged: 155 patients (85.1%) recovered and were discharged without complications.
- ICU Admission: 20 patients (11%) required ICU admission due to complications like shock or organ involvement.
- Death: 5 patients (2.7%) succumbed to complications related to severe dengue (DSS).

6. Association Between Platelet Count and Severity:

- A significant inverse correlation was found between platelet count and severity score (p-value < 0.05).

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- Patients with severe dengue had a mean platelet count of 35,000/mm³, whereas those with mild dengue had an average platelet count of 85,000/mm³.

7. Seasonal Variation:

- Maximum cases were reported during the post-monsoon period (August to October), accounting for 68% of total cases.
- A gradual decline was seen from November to February.

8. Complications:

- Dengue Shock Syndrome (DSS): Reported in 12 cases (6.6%).
- Dengue Hemorrhagic Fever (DHF): Reported in 30 cases (16.5%).
- Multiorgan Failure: Seen in 5 cases (2.7%).

9. Diagnostic Efficacy:

- NS1 antigen test was positive in 85% of cases within the first 5 days of fever onset.
- IgM antibody test was positive in 92% of cases after the 5th day of fever.
- Combined sensitivity and specificity of NS1 and IgM tests were 94% and 96%, respectively.

Discussion

This study analyzed the clinical profile, laboratory findings, and outcomes of pediatric dengue cases among children aged 7 to 18 years admitted to a tertiary care hospital. The highest prevalence was noted in the 10–12 years age group, with a slight male predominance (1.2:1). Fever (98%), headache (65.9%), vomiting (54.9%), and rash (49.5%) were the most common symptoms, while bleeding manifestations and hepatomegaly were also frequently observed. According to the revised WHO classification, 43.9% of cases were classified as Dengue without Warning Signs (D), 33% as Dengue with Warning Signs (DWS), and 23.1% as Severe Dengue (SD). Laboratory findings showed thrombocytopenia in 78% of cases, leukopenia in 58%, and elevated liver enzymes in 41%, correlating with

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disease severity. Early diagnosis using NS1 antigen and IgM antibody tests showed high sensitivity (85% and 92%, respectively). Outcomes were favorable, with 85.1% of patients discharged without complications, 11% requiring ICU admission, and a 2.7% mortality rate, reflecting the importance of early identification and aggressive supportive care. Seasonal peaks were observed during the post-monsoon period, highlighting the need for effective vector control. The study underscores the need for vigilant monitoring, early diagnosis, and timely intervention to reduce mortality and improve patient outcomes.

Conclusion

In conclusion, this study highlights the clinical profile, laboratory findings, and outcomes of pediatric dengue cases in a tertiary care hospital, reinforcing the importance of early diagnosis and prompt management. Fever, headache, vomiting, and rash were the most common symptoms, with a high prevalence of thrombocytopenia, leukopenia, and elevated liver enzymes correlating with disease severity. The revised WHO classification effectively stratified patients based on severity, aiding in targeted management. Early diagnosis using NS1 antigen and IgM antibody tests showed high sensitivity and specificity, facilitating timely intervention. Favorable outcomes in 85.1% of cases and a low mortality rate (2.7%) emphasize the importance of early identification and supportive care in reducing complications and improving survival rates. Seasonal peaks during the post-monsoon period underline the need for effective vector control and public health strategies to prevent future outbreaks.

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