UNIVERSITY-ORIENTED STUDENT NOTES

DENGUE

It is mid-August during monsoon season. In an urban locality, a 16-year-old boy presents with:

- 3 days of high fever
- Severe body ache and retro-orbital pain
- On Day 4, his fever subsides
- He develops severe abdominal pain and persistent vomiting

On examination: Pulse: 110/min, BP: 100/70 mmHg, Platelets: 85,000/mm^3, Hematocrit: Increased by 25% from baseline

Meanwhile, 12 similar cases have been reported from the same locality in the last one week.

1. What is the most probable diagnosis?
2. In which phase of illness is this patient currently?
3. Why is rising hematocrit dangerous?
4. How would you classify this case?
5. Does this situation suggest an outbreak? Why?
6. What immediate public health action should be taken

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Definition

Dengue is an acute viral infection caused by dengue virus (DENV 1–4), transmitted by the bite of infected female *Aedes* mosquitoes, characterized by fever, myalgia, rash, and in severe cases, plasma leakage, bleeding and shock.

Epidemiological Triad:

Agent	Host	Environment

• Dengue virus (Flavivirus)
• 4 serotypes: DENV-1, 2, 3, 4
• Infection with one → lifelong immunity to that serotype
• Secondary infection → ↑ risk of severe dengue
• **Intrinsic incubation period (human):** 4–10 days
• **Extrinsic incubation period (mosquito):** 8–12 days at 25–28°C
	• All ages susceptible
	• Severe dengue more common in:
	  ○ Secondary infection
	  ○ Children
	  ○ Pregnant women
	  ○ Comorbidities
	• High viremia increases transmission risk
		• Urbanization
		• Water storage practices
		• Poor solid waste disposal
		• Temperature (affects EIP)
		• Monsoon season

Note: Intrinsic incubation occurs in the human host before symptom onset, whereas extrinsic incubation occurs in the mosquito before it becomes capable of transmitting dengue.
If EIP shortens (because temperature rises):
→ Mosquito becomes infectious faster
→ More transmission
→ Bigger outbreak
That's why dengue increases during monsoon and warm weather.

Transmission Dynamics

Mosquito → Human Transmission	Human → Mosquito Transmission	Other Modes

• Main vector: **Aedes aegypti**
• Day-biting mosquito
• After feeding on viremic human → virus replicates in mosquito midgut → salivary glands
• **EIP: 8–12 days (temperature dependent)** Once infectious → remains infectious for life
	• Occurs when mosquito bites viremic person
	• Transmission possible:
	  ○ 2 days before symptoms
	  ○ Up to 2 days after fever resolves
	• Viremia usually 4–5 days (may last 12 days)
		• Vertical transmission (rare)
		• Blood transfusion
		• Organ transplantation
		• Transovarial transmission in mosquitoes

Pathogenesis

- Antibody-dependent enhancement (ADE)
- Cytokine storm
- Increased capillary permeability
- Plasma leakage → hemoconcentration
- Thrombocytopenia
- Shock (Dengue Shock Syndrome)

Clinical Course (Three Phases)

Phase	Duration	Key Features
Febrile	2–7 days	High fever, myalgia
Critical	Around defervescence*	Plasma leakage, shock risk
Recovery	48–72 hrs	Reabsorption of fluid

Most deaths occur during **critical phase**: WHY?

↓

*In dengue, defervescence is **dangerous**, not reassuring.

When fever falls:

- Capillary permeability increases
- Plasma leakage begins
- Hematocrit rises
- Platelets fall
- Risk of shock increases

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Clinical Spectrum (WHO Classification)

Dengue (without warning signs)	Dengue with Warning Signs	Severe Dengue
Fever + 2 of: • Headache • Retro-orbital pain • Myalgia • Arthralgia • Rash • Nausea • Leukopenia	• Abdominal pain • Persistent vomiting • Fluid accumulation • Mucosal bleed • Lethargy • Hepatomegaly • Rising hematocrit with falling platelets	• Severe plasma leakage → shock • Severe bleeding • Severe organ involvement
Treatment depends on the severity of the disease		

Diagnosis

A. Clinical (Probable Case)

Acute fever + 2 features (as above)

B. Laboratory Diagnosis

Test	Time of Detection
NS1 antigen	Day 1–5
RT-PCR	Early phase
IgM ELISA	After day 5
IgG	Secondary infection

Other findings:

- Thrombocytopenia (<100,000/mm³)
- Rising hematocrit (>20% increase)

Case Management

Group A	**Group B**	**Group C**
Dengue (without warning signs)	**Dengue with Warning Signs**	**Severe Dengue**
• ORS • Paracetamol • Avoid NSAIDs • Daily monitoring	• Warning signs present	• IV fluids • Monitor hematocrit • Blood transfusion if indicated
Home care	Hospitalisation is required	

Prevention and Control

Level of Prevention	Objective	Measures in Dengue
Primordial Prevention	Prevent development of risk factors	• Proper urban planning • Covered water storage • Solid waste management • Drainage improvement • Pre-monsoon community awareness
Primary Prevention	Prevent occurrence of disease	**Vector Control:** Source reduction (eliminate stagnant water) • Weekly dry day • Larvicides • Fogging (during outbreak) • Biological control • Integrated Vector Management (IVM) **Personal Protection:** • Repellents • Full sleeves • Screens **Vaccination:** • CYD-TDV (Dengvaxia)
Secondary Prevention	Early detection & prevent progression	• Early diagnosis (NS1, IgM ELISA) • Surveillance (IDSP) • Case reporting • Triage (Group A/B/C) • Monitoring Hct & platelets • Early fluid therapy
Tertiary Prevention	Reduce complications & mortality	• ICU management • Shock management • Blood transfusion • Organ support • Reduce case fatality

National Programme (India)

Under **National Vector Born Disease Control Program (NVBDCP)**

Objectives:

- Reduce mortality
- Early diagnosis
- Strengthen surveillance*
- Integrated vector management
- Epidemic preparedness

***Surveillance**

- IDSP reporting
- Sentinel surveillance
- Laboratory confirmation
- Outbreak investigation

Important Indices used for surveillance

	House Index	Container Index	Breteau Index
Definition	Percentage of houses infested with Aedes larvae or pupae.	Percentage of water-holding containers infested with larvae or pupae	Number of positive containers per 100 houses inspected.
Formula	HI = {Number of houses positive for larvae}/{Total houses inspected} x 100	CI = {Number of positive containers}}/{Total containers examined}x 100	{Number of positive containers} x{Total houses inspected} x100
Indicates	Extent of household infestation.	Proportion of breeding containers.	Most sensitive indicator of transmission risk.

Higher index = higher risk of dengue outbreak.

High-Yield Comparisons

DF	DHF	DSS
Fever	Plasma leakage	Shock
Mild thrombocytopenia	Platelets <100,000	Narrow pulse pressure
No shock	Hemoconcentration	Hypotension

PBQ 1

Focus: Clinical Classification + Warning Signs

Scenario

A 14-year-old boy presents with 3 days of high-grade fever, severe body ache, retro-orbital pain and rash. On day 4, his fever subsides but he develops severe abdominal pain and persistent vomiting. Platelet count is 95,000/mm³ and hematocrit has increased by 22% from baseline.

Questions

a) What is the probable diagnosis?

b) Classify this case according to WHO classification.

c) What is the significance of rising hematocrit?

d) What is the immediate management priority?

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Model Answer

a) Probable Diagnosis: Dengue infection.

b) WHO Classification

Dengue with Warning Signs

Because:

- Abdominal pain
- Persistent vomiting
- Rising hematocrit
- Thrombocytopenia

c) Significance of Rising Hematocrit

- Indicates plasma leakage
- Hemoconcentration
- Marker of critical phase
- Risk of progression to shock

d) Immediate Management Priority

- Hospital admission
- Careful IV fluid therapy
- Monitor hematocrit every 4–6 hours
- Monitor urine output
- Avoid NSAIDs

PBQ 2

Focus: Lab Interpretation (Hematocrit + Platelets)

Scenario

A 22-year-old female diagnosed with dengue is admitted.

Day 3 labs:

Platelets = 1,20,000/mm^3

Hematocrit = 38%

Day 5 labs:

Platelets = 65,000/mm^3

Hematocrit = 46%

Questions

a) Interpret the trend in platelet and hematocrit values.

b) Which phase of dengue is this patient likely in?

c) What complication is she at risk for?

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Model Answer

a) Interpretation

- Platelet count decreasing
- Hematocrit rising (>20% increase)
- Suggests plasma leakage

b) Phase

Critical phase (around defervescence).

c) Complication Risk

- Dengue shock syndrome
- Hypovolemic shock

PBQ 3

Focus: Transmission Dynamics + Viremia

Scenario

A 30-year-old man develops fever on Monday. He attends a crowded office daily until Wednesday. Aedes mosquitoes are present in the locality. Fever resolves by Friday.

Questions

a) During which period was he capable of transmitting infection to mosquitoes?

b) Explain extrinsic incubation period.

c) Why does temperature influence dengue transmission?

Model Answer

a) Transmission Period

- 2 days before symptom onset
- Up to 2 days after fever subsides
- Viremia usually 4–5 days

b) Extrinsic Incubation Period

- Time taken by virus to multiply inside mosquito
- From ingestion of virus to ability to transmit
- Usually 8–12 days at 25–28°C

c) Temperature Influence

- Higher temperature shortens EIP
- Increases mosquito breeding
- Increases transmission efficiency

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PBQ 4

Focus: Outbreak Investigation + Surveillance

Scenario

During monsoon, 35 cases of acute febrile illness with thrombocytopenia are reported from one urban ward within 1 week.

Questions

a) What constitutes an outbreak?

b) Outline steps in outbreak investigation.

c) Name surveillance systems used in India for dengue.

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Model Answer

a) Outbreak Definition

Occurrence of cases in excess of expected number in a given area and time.

b) Steps in Outbreak Investigation

1. Confirm diagnosis
2. Confirm outbreak
3. Define case
4. Descriptive epidemiology (time, place, person)
5. Laboratory confirmation
6. Implement control measures
7. Communicate findings

c) Surveillance Systems

- IDSP
- Sentinel surveillance
- NCVBDC reporting

PBQ 5

Focus: Vector Indices + Field Control

Scenario

A larval survey in a locality shows:

- 200 houses inspected
- 40 houses positive for Aedes larvae
- 60 containers positive

Questions

a) Calculate House Index.

b) Calculate Container Index.

c) What do these indices indicate?

d) Suggest field control measures.

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Model Answer

a) House Index

HI = (40 / 200) × 100

= 20%

b) Container Index

CI = (60 / Total containers examined) × 100

(If total containers not given, explain formula)

c) Significance

- Indicates density of Aedes breeding
- Helps assess outbreak risk
- Guides vector control intensity

d) Control Measures

- Source reduction
- Weekly dry day
- Larvicides
- Fogging in outbreak

PBQ 6

Focus: Levels of Prevention

Scenario

Municipal authorities introduce weekly dry day campaigns, early NS1 testing facilities, and ICU management units for severe dengue.

Questions

Classify these interventions under levels of prevention.

Model Answer

- Weekly dry day → **Primary prevention**
- Early NS1 testing → **Secondary prevention**
- ICU management → **Tertiary prevention**
- Urban planning → **Primordial prevention**

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