Dengue Fever

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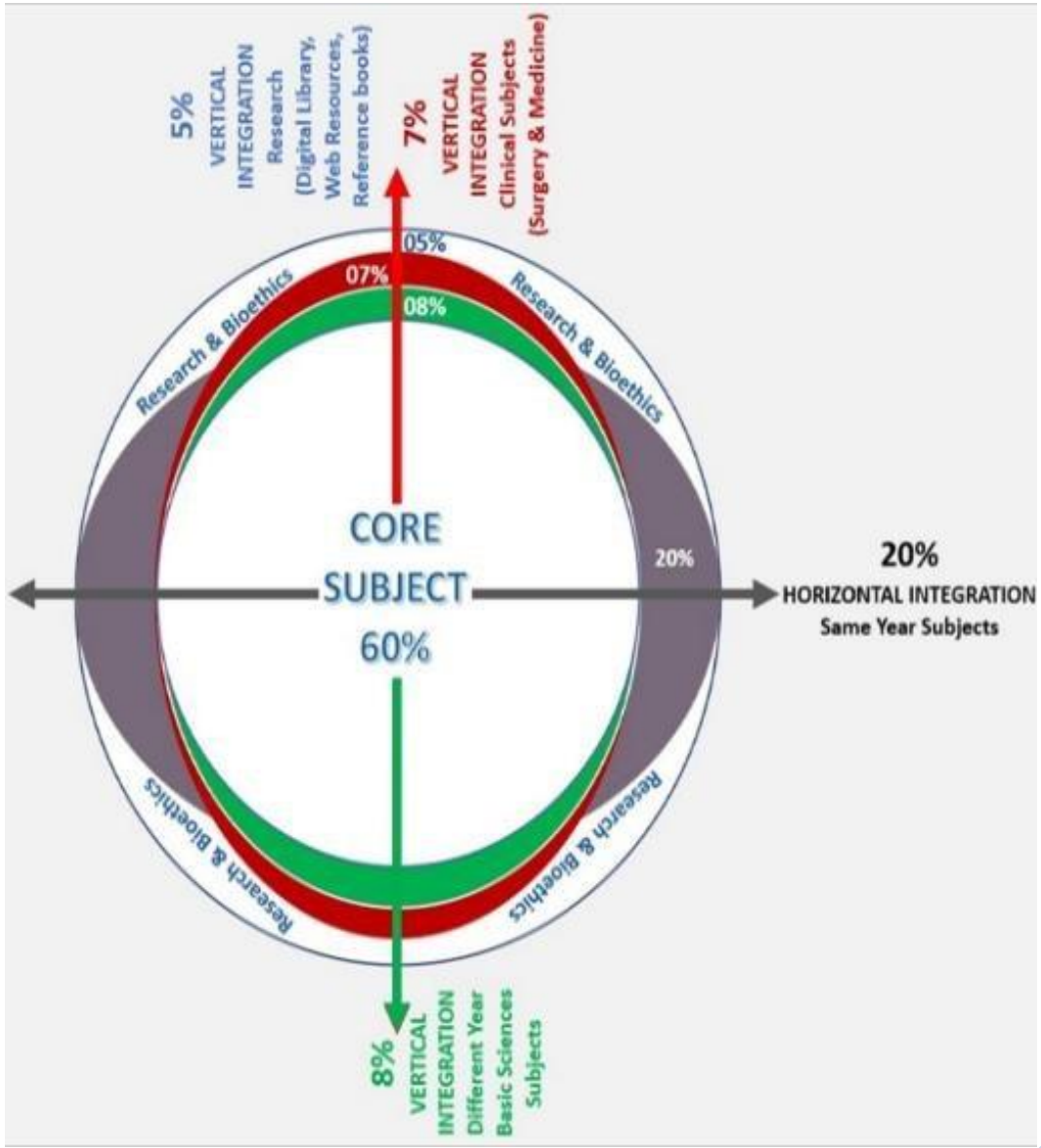
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Learning Objectives

- Define dengue fever and its clinical significance.
- Describe the epidemiology and endemic patterns of dengue fever.
- Explain the modes of transmission and risk factors.
- Identify clinical features, including phases and severe forms.
- Outline diagnostic tests and their clinical importance.
- Discuss principles of management and prevention strategies

Introduction

Dengue is a febrile illness caused by a flavivirus transmitted by a mosquito.

Principle vector of dengue is Aedes Aegypti.

Breeds in standing water, collections of water in containers, water-based air coolers, and tire dumps are a good environment for the vector to breed.

There a 4 serotypes of the virus. They all produce a similar clinical syndrome.

Aedes mosquito

Aedes Aegypti

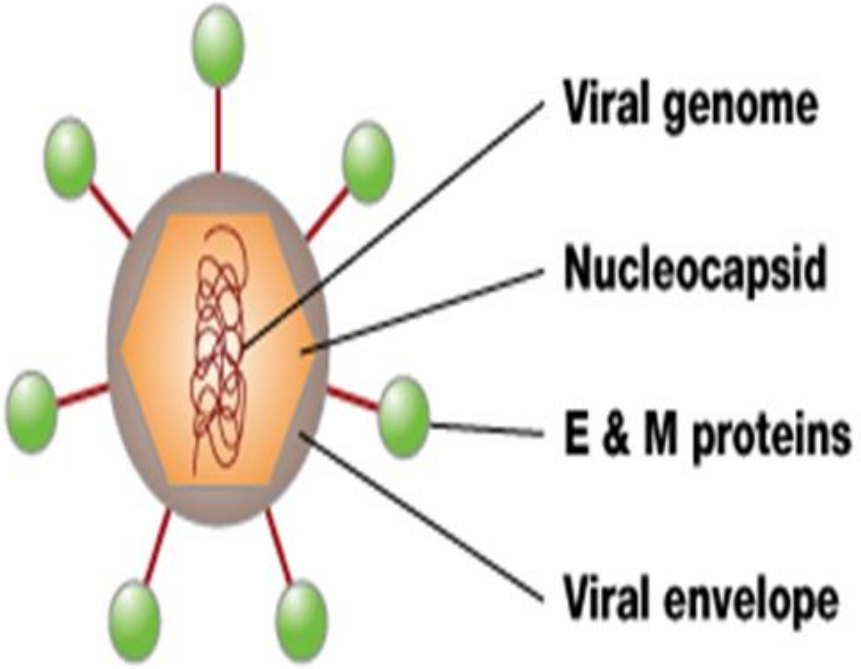
Aedes Albopictus

Remember

Type specific immunity is lifelong but immunity against other types lasts only a few months.

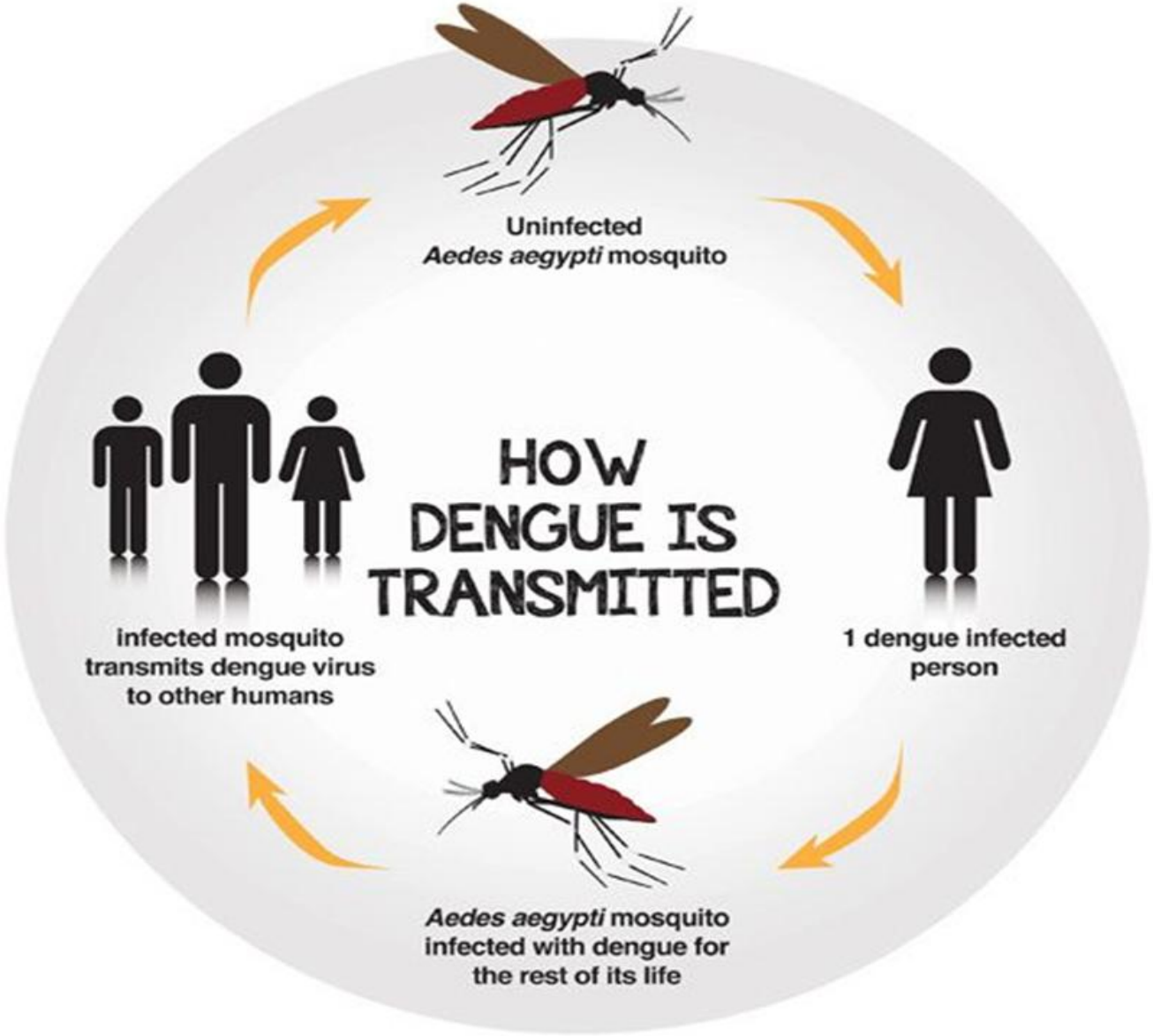
Dengue virus

- **Family :** Flaviviridae
- **Genus :** Flavivirus
- **Serotypes :** DV1, DV2, DV3, DV4
- Enveloped virus
- 3 Major proteins
- SS Positive sense RNA



Transmission is vector born

Incubation period 2 to 10 days

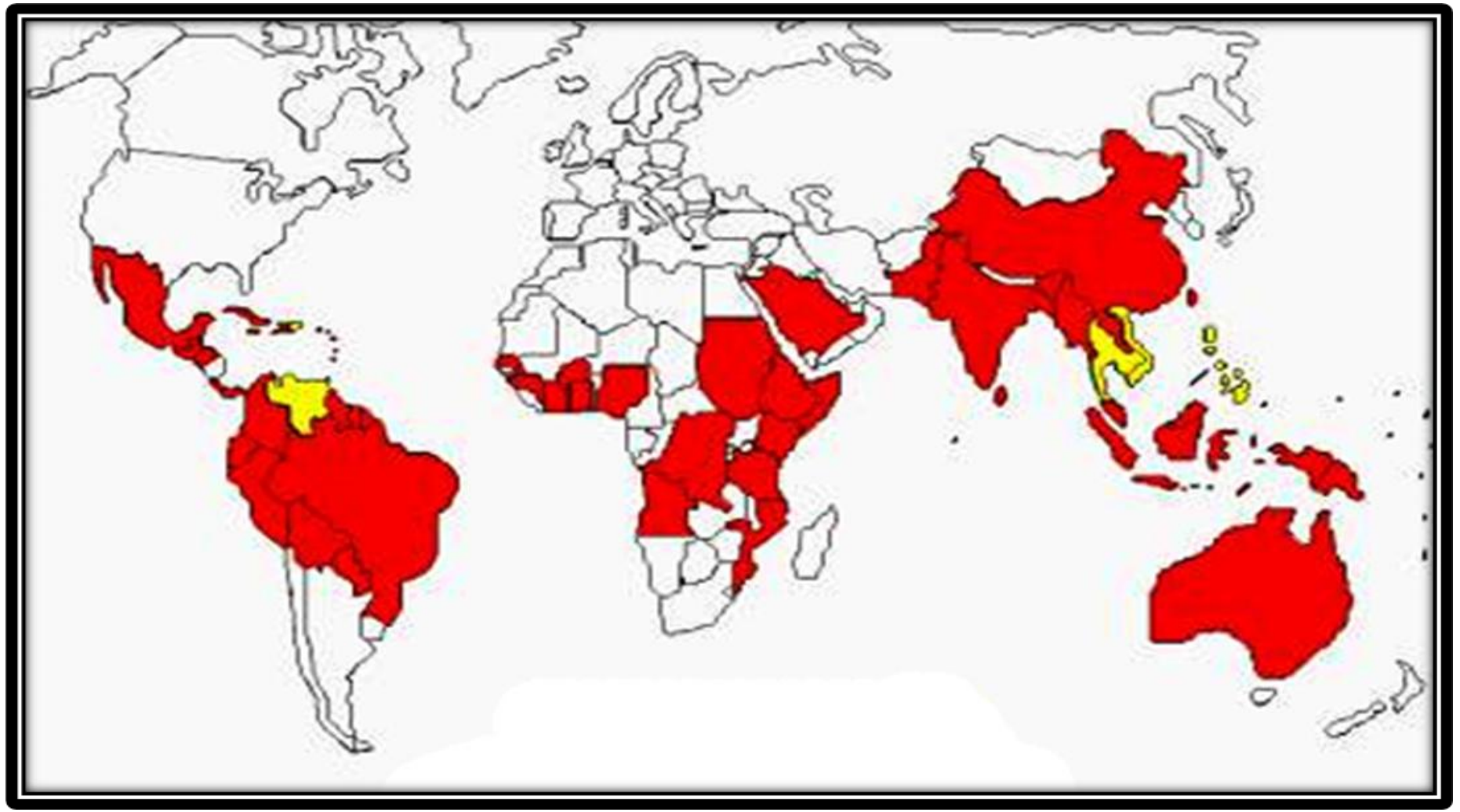


How dengue is transmitted. World Health Organisation. Dengue guidelines for diagnosis,treatment, prevention and control. 2009; Figure adapted from http://www.nature.com/scitable/content/dengue-transmission-22400749. Accessed 23 May.

Epidemiology

- The disease is endemic in more than 100 countries in the regions of Africa, the Americas, the eastern Mediterranean, South-East Asia and the Western Pacific.
- The Americas, South-East Asia and Western pacific regions are the most seriously affected.
- Asia representing ~70% of the global burden of disease.

Worldwide distribution of dengue fever



- The first confirmed outbreak of DHF in Karachi Pakistan occurred in **1994** with 145 cases and one fatality was reported.
- 1st major epidemic in Punjab in **2011**, 21,685 cases and 350 deaths were reported.

Conclusions

There is an increasing trend in dengue infection in Mizoram, and seasonality of the disease was observed with the peak season during July to December. The higher incidence rate among the adults indicated that outdoor activities may be related to the high risk of the infection. However, lack of immunity among the older people may also be a possible reason of higher disease incidence rather than the activity pattern. Early identification and frequent monitoring of infected vector mosquitoes will yield an early warning indicator for forecasting dengue epidemics in the future.

Research | Open access | Published: 29 November 2024

Dengue epidemiology and molecular characterization of vector mosquitoes; *Aedes aegypti* and *Aedes albopictus* in Mizoram, Northeast India

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Pathogenesis

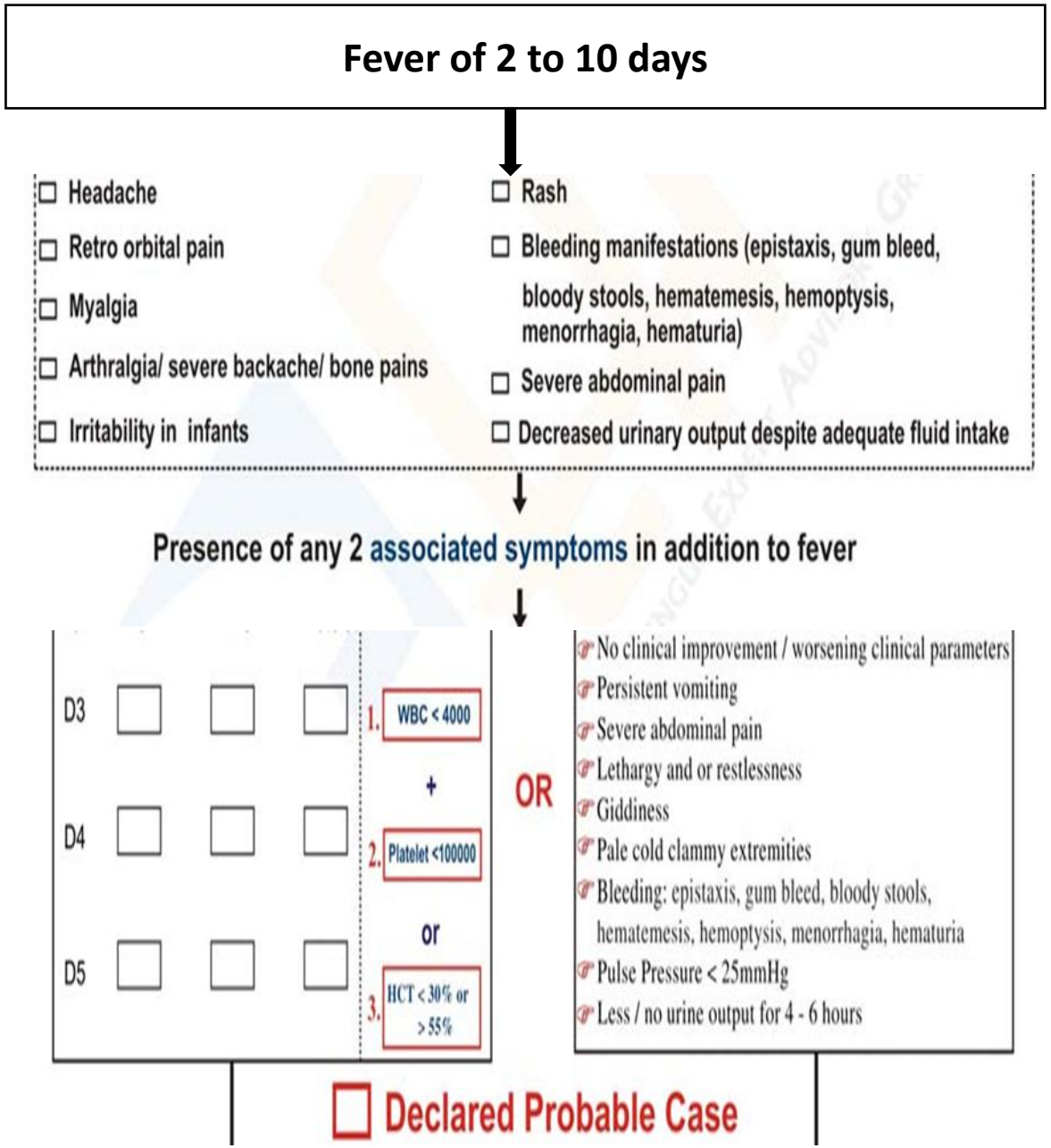
Bite of Aedes Aegypti

The virus infects and replicates in the Langerhans cells, to the lymphatic system then go to circulation to result in viremia.

DEN-NS1 binding to TLR4 of PBMCs induces the expression and secretion of TNF-α, IL-1β and IL-6 cytokines, which may disrupt the tight junction, leading to vascular leakage.

DEN-NS1 and LPS can activate immune cells through TLR4, NS1 may induce platelet activation and enhance aggregation, possibly leading to over-destruction of platelets during dengue infection.

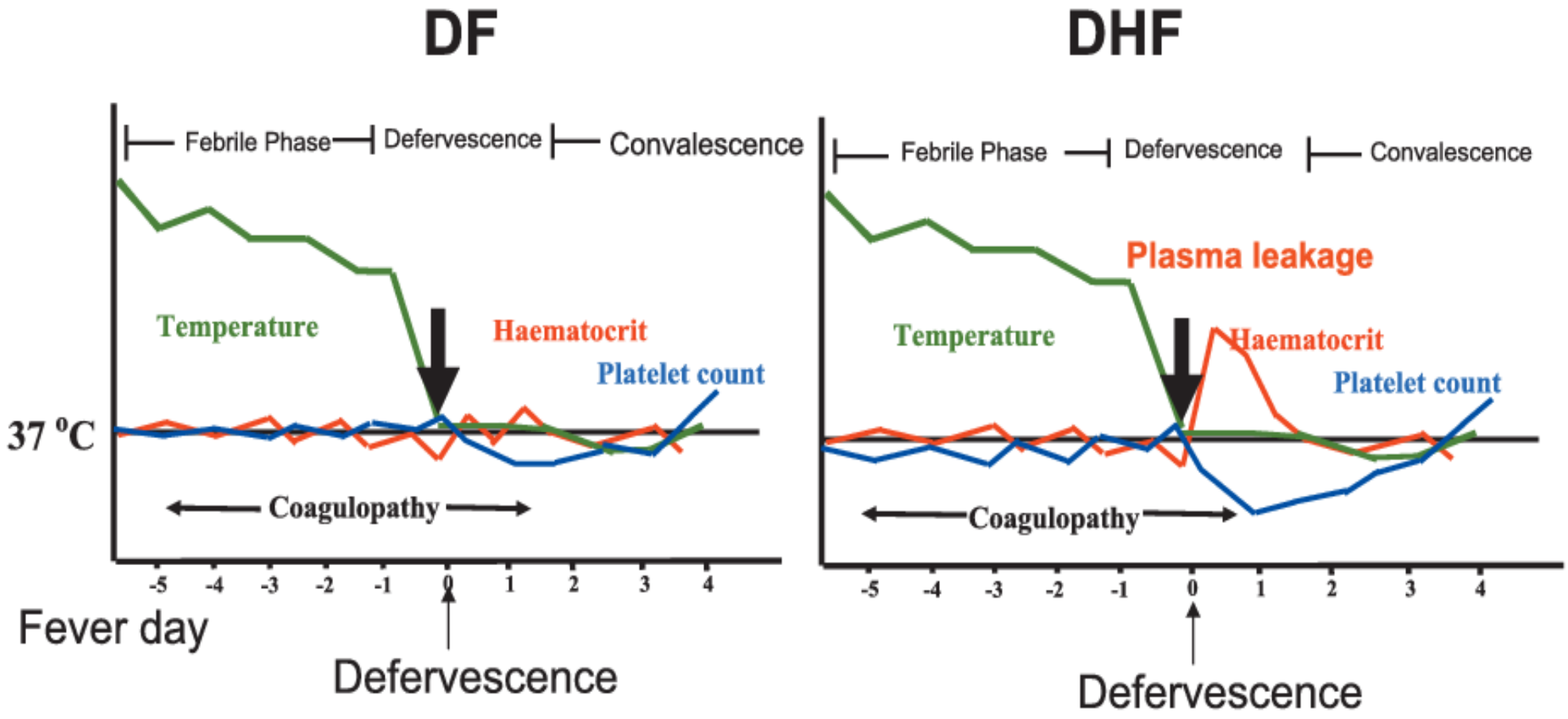
Clinical features



Dengue related rash during convalescence stage. This maculo-popular rash is flat, erythematous and blanchable(disappears upon pressure): typically described as isles of white in a sea of red.

The rash in dengue is usually centripetal.(This means that the rash starts on the limbs before "moving" or spreading to the trunk.)

Natural course of dengue fever



Dengue hemorrhagic fever

Key feature is **PLASMA LEAK**

- Rising HCT 20% or more or even less but towards 20% if on IV fluids or on excess oral fluids.
- Development of ascites and pleural effusion.
- Cholesterol <100mg/dl (or drop of 20mg/dl)
- Albumin <3.5 g/dl (or drop of 0.5g/dl)

Dengue shock syndrome

- Occurs at day 3-7 of illness, lasts for 24-48 hours
- Clinically **Fever settled**
- Tachycardia
- CRFT >2seconds
- Pulse pressure ≤ 20 mm hg
- Urinary output <0.5-1 ml/hour
- Tender hepatomegaly

Diagnosis

- **Blood complete picture:** thrombocytopenia, leucopenia, neutropenia.
- **Polymerase chain reaction– (DENV-RNA by RT-PCR):** positive in first five days of illness
- **Non-structural protein-1 (NS1 antigen):** positive in first four days of illness.
- **ELISA:** diagnosis is confirmed by seroconversion of IgM antibody or 4-fold increase in IgG antibody titers.

Treatment

- Treatment of simple dengue fever is supportive.
- Fluid replacement and appropriate management of shock and organ dysfunction.
- Paracetamol for the relief of fever.
- Don’t use NSAIDs or steroids.
- Don’t use antibiotics.

Algorithm A - Fluid Management in Compensated Shock

COMPENSATED SHOCK

Signs of Plasma leak Signs of reduced perfusion like.

- Cold clammy skin, tachycardia, restlessness, increased thirst, increased capillary refill time

PLUS-**pulse** pressure 20-30 mm, or Urine output 25-30ml/hr - (0.5ml/kg/hr)

Fluid resuscitation with isotonic crystalloid 10 ml/kg over 1 hour(500ml in adult of 50kg or above)

Any improvement?

Send CBC, HCT, LFTs, BU, SE, Ca^{++}, Glucose, HCO_3, GXM[1]

Yes

- Measure urine output.
- Infuse N/S @ 1.5-10 ml/kg/hr- Keeping to the minimum infusion rate, sufficient to maintain a urine output of 0.5 ml/kg/hr.
- Upon improvement, fluid can be further adjusted to stick to the fluid quota.
- Monitor HCT 4 - 6 hourly
- If the patient becomes unstable at any time, Go to ★
- Consider stopping IV fluid at 48 hours of plasma leakage / defervescence or earlier according to clinical judgment

No

★ **Check HCT**

↑ Or normal HCT or less than 10 points reduction of HCT from the baseline

Administer another bolus N/S

10 ml/kg/hr over 60min

i-e, 500 cc in 60 minutes

Is there any Improvement?

Yes → (to ★ Check HCT)

No

Total Amount of fluid given?

Less than 30 ml/kg → (to ★ Check HCT)

More than 30 ml/kg

Administer Colloid infusion 10 - 20 ml/kg over 1 - 2 hrs respectively

Any Improv-ement?

No

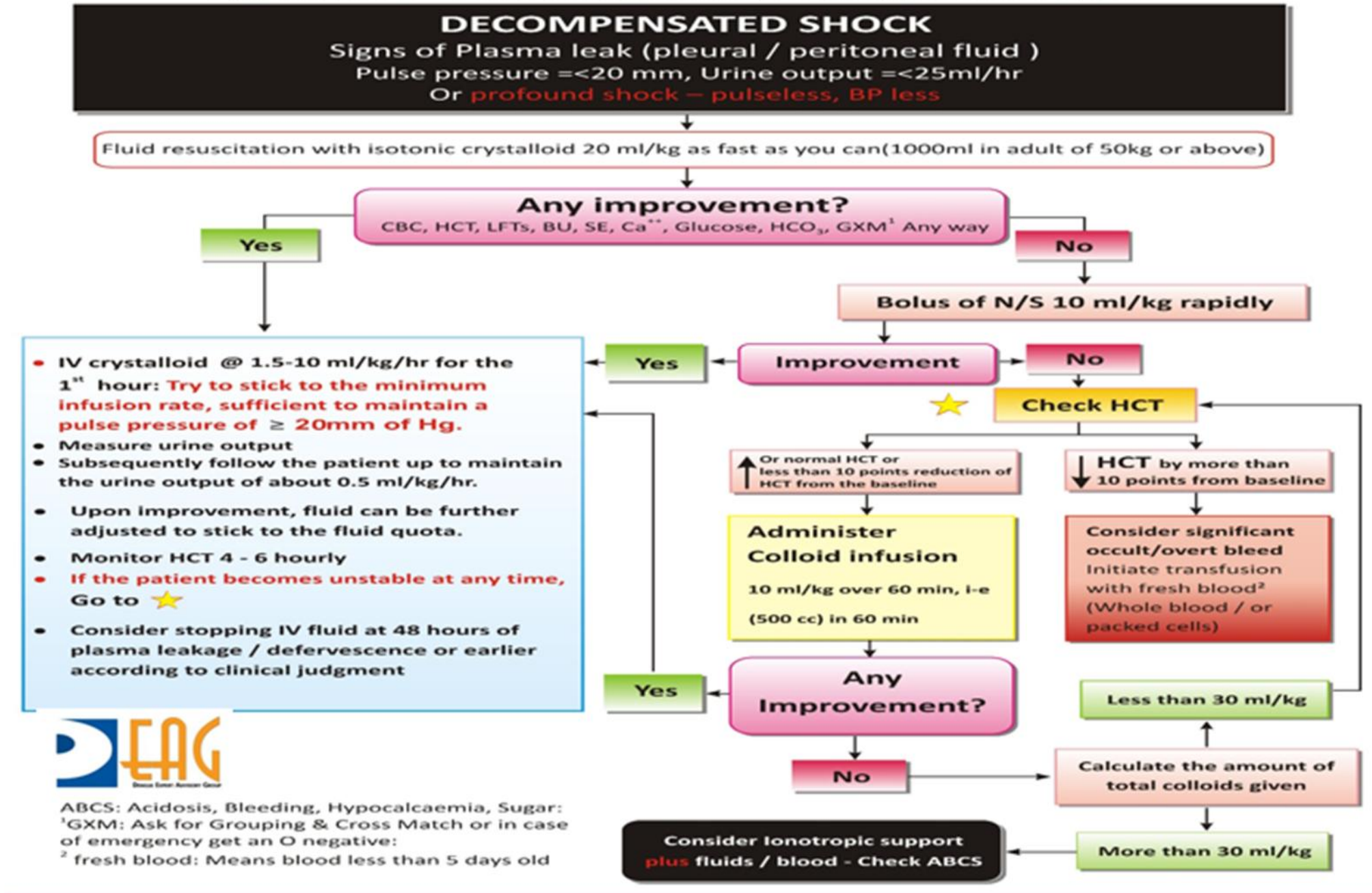
Consider Ionotropic support plus **fluids / blood - Check ABCS**

↓ **HCT** by more than 10 points from baseline

Consider significant occult/overt bleed Initiate transfusion with fresh blood[2] (Whole blood / or packed cells)

ABCS: Acidosis, Bleeding, Hypocalcaemia, Sugar: [1]GXM: Ask for Grouping & Cross Match or in case of emergency get an O negative: [2] fresh blood: Means blood less than 5 days old

Algorithm : B – Fluid Management in Decompensated Shock



Prevention

- **Prevention of mosquito breeding:**

Covering, emptying and cleaning of domestic water storage containers on a weekly basis.

Applying appropriate insecticides to water storage outdoor containers.

- **Personal protection from mosquito bites:**

Window screens, repellents, coils and vaporizers.

Wearing clothing that minimizes skin exposure to mosquitoes.

Dengue virus vaccine

- The first dengue vaccine, Dengvaxia® (CYD-TDV) developed by Sanofi Pasteur was licensed in December 2015 and has now been approved by regulatory authorities in ~20 countries.
- In November 2017, retrospective data of vaccination statistics showed that the subset of trial participants who were inferred to be seronegative at time of first vaccination had a higher risk of more severe dengue and hospitalizations from dengue compared to unvaccinated participants.

ETHICAL ISSUES

- Ensuring equitable access to healthcare resources during outbreaks
- Addressing stigma associated with the disease.
- Balancing individual rights with public health measures like vector control.
- Transparency in case reporting and equitable vaccine distribution are critical.

THANKYOU