Dengue (DEEngee) Break-bone Fever
Who is Responsible

• Usually Four types of Dengue Virus, Fifth type has been identified in 2013
  • DENV-1
  • DENV-2
  • DENV-3
  • DENV-4
  • DENV-5 (Sylvatic- Occurring in Wild Animals)
3D Structure of Virus

- Fusion
- Matrix
- RNP Complex
- Lipid Membrane
- Attachment
Hard Facts

• It is estimated that there are over 100 million cases of dengue worldwide each year.
• About 2.5 billion people, or 40% of the world’s population, live in areas where there is a risk of dengue transmission.
• Dengue is endemic in at least 100 countries in Asia, the Pacific, the Americas, Africa, and the Caribbean.
• Infection with one serotype does not protect against the others.
• Many suffering from Mild Dengue recover uneventfully.
• Dengue hemorrhagic fever (DHF) and Dengue shock syndrome (DSS) are Severe forms of Dengue.
The Villain (Vector)
Aedes aegyptis, Aedes albopictus, Aedes polynesiensis
Who are at Risk!

The contour lines of the January and July isotherms indicate the potential geographical limits of the northern and southern hemispheres for year-round survival of *Aedes aegypti*, the principal mosquito vector of dengue viruses.


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Vector & Host

Spreads by tropical mosquito bites
Life Cycle

- Mating
- Female needs blood for the production of eggs
- Adult emerges from the pupa
- Oviposition, most times slightly above the water surface
- Eggs develop to larvae in the water
- Eggs in the water
- First larval stage
- Second larval stage
- Third larval stage
- Fourth larval stage
- Larva
- Pupa
- Pupa
- Imago
- Adult insect
- Moulting between each stage
Life Cycle

1. Eggs
2. Larvae
3. Pupae
4. Adult

Terrestrial
Aquatic
Eggs/Hosts

Terrestrial
Aquatic

2. Larvae

3. Pupae

4. Adult
Overview (Habit)

Typically:

- These mosquitoes do not fly far, the majority remaining within 100 metres of where they emerged. Max. flying distance is 400 mtrs.

- They feed almost entirely on humans, mainly during daylight hours, and both indoors and outdoors.
Overview (Human–Vector contact)

- Household and immediate vicinity
- Schools, Hospitals and Workplaces
- *Many purposely-filled household* containers such as those used for domestic water storage and for decorative plants
- Rain-filled habitats – including used tyres, discarded food and beverage containers, blocked gutters and buildings under construction.
How it Starts & Ends

• Symptoms usually begin 4 - 7 days after the mosquito bite and typically last 3 - 10 days.

• For transmission to occur the mosquito must feed on a person during a 5- day period when large amounts of virus are in the blood; this period usually begins a little before the person become symptomatic.

• Some people without significant symptoms can still infect mosquitoes.

• After entering the mosquito in the blood meal, the requires an additional 8-12 days incubation before it can then be transmitted to another human.

• The mosquito remains infected for the remainder of its life, which might be days or a few weeks.
What Happens

Symptoms of Dengue fever

- Febrile phase
  - sudden-onset fever
- Critical phase
  - hypotension
  - pleural effusion
  - ascites
  - gastrointestinal bleeding
- Recovery phase
  - altered level of consciousness
  - seizures
  - itching
  - slow heart rate

- headache
- mouth and nose bleeding
- muscle and joint pains
- vomiting
- rash
- diarrhea
Classification

Figure 1.4 Suggested dengue case classification and levels of severity

**DENGUE ± WARNING SIGNS**

- **with warning signs**
- **without**

**SEVERE DENGUE**

1. Severe plasma leakage
2. Severe haemorrhage
3. Severe organ impairment

**CRITERIA FOR DENGUE ± WARNING SIGNS**

- **Probable dengue**
  - Live in/travel to dengue endemic area.
  - Fever and 2 of the following criteria:
    - Nausea, vomiting
    - Rash
    - Aches and pains
    - Tourniquet test positive
    - Leukopenia
    - Any warning sign

- **Laboratory-confirmed dengue**
  - Important when no sign of plasma leakage

**Warning signs**

- Abdominal pain or tenderness
- Persistent vomiting
- Clinical fluid accumulation
- Mucosal bleed
- Lethargy, restlessness
- Liver enlargement >2 cm
- Laboratory: increase in HCT concurrent with rapid decrease in platelet count

*requiring strict observation and medical intervention*

**CRITERIA FOR SEVERE DENGUE**

- **Severe plasma leakage**
  - Leading to:
    - Shock (DSS)
    - Fluid accumulation with respiratory distress

- **Severe bleeding**
  - As evaluated by clinician

- **Severe organ involvement**
  - Liver: AST or ALT >=1000
  - CNS: Impaired consciousness
  - Heart and other organs
Clinical Course

Days of illness

1 2 3 4 5 6 7 8 9 10

Temperature

-40°

Potential clinical issues

Dehydration  Shock bleeding  Reabsorption fluid overload

Organ impairment

Laboratory changes

Hematocrit  Platelet

Serology and virology

Viraemia  IgM/IgG

Course of dengue illness:

Febrile  Critical  Recovery phases

* Source: adapted from Yip (2) by chapter authors.
## Confusion (DD)

<table>
<thead>
<tr>
<th>Diarrhoeal diseases</th>
<th>Rotavirus, other enteric infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illnesses with neurological manifestations</td>
<td>Meningo/encephalitis</td>
</tr>
<tr>
<td></td>
<td>Febrile seizures</td>
</tr>
</tbody>
</table>

### Conditions that mimic the critical phase of dengue infection

<table>
<thead>
<tr>
<th>Infectious</th>
<th>Acute gastroenteritis, malaria, leptospirosis, typhoid, typhus, viral hepatitis, acute HIV seroconversion illness, bacterial sepsis, septic shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malignancies</td>
<td>Acute leukaemia and other malignancies</td>
</tr>
</tbody>
</table>
| Other clinical pictures | Acute abdomen  
  - acute appendicitis  
  - acute cholecystitis  
  - perforated viscus  
  Diabetic ketoacidosis  
  Lactic acidosis  
  Leukopenia and thrombocytopenia ± bleeding  
  Platelet disorders  
  Renal failure  
  Respiratory distress (Kussmaul’s breathing)  
  Systemic Lupus Erythematosus |
Problems & Solutions

Inside House

• Use mosquito repellants, coils, door & window screens, Mosquito nets, air-conditioning
Habitat of Lady Aedes

Flower Vases filled with water

• Empty, Clean and Scrub weekly
Keep mosquitoes out of your septic tank

Mosquitoes can get inside broken or unsealed septic tanks and lay eggs. Each day thousands of mosquitoes fly out of cracked or broken septic tanks. Mosquitoes can spread viruses like Zika, dengue, West Nile, and chikungunya.

Mosquitoes may be laying eggs inside your septic tank if it is:
- Open or unsealed
- Broken with cracks or spaces between the blocks
- Missing a ventilation pipe screen cover

Inspect and repair your septic tank to keep mosquitoes out

Here’s how:
- Seal the septic tank.
- Repair cracks or gaps in the exterior walls of the septic tank using cement.
- Cover ventilation pipes with a screen mesh, repair broken pipes, and seal at the joints.
- Fill abandoned or unused septic tanks with dirt or gravel.
Habitat of Lady Aedes
Plants as breeding place

YELLOW FEVER MOSQUITO EGGS
Habitat of Lady Aedes

Used Bottles & thrown out Utensils

- Collect and dispose of
Habitat of Lady Aedes

Coconut Shells
Habitat of Lady Aedes

Discarded Tyres

• Should be collected, recycled & disposed of by proper incineration in waste transformation facilities
Habitat of Lady Aedes

Gutters

- Fill with sand, soil or concrete; Clear clogging
Habitat of Lady Aedes

Roof Top Gutters

- Modify design, repair and/or clean
Building structures

• Under revised legislation in Singapore, roof gutters are not permitted on buildings in new developments because they are difficult to access and maintain.

• Moreover, property owners are required to remove existing gutters on their premises if they are unable to maintain them satisfactorily.
Habitat of Lady Aedes

Tree Holes

- Fill with sand, soil or concrete
Habitat of Lady Aedes

Water-storage-tank or cistern

- Containers can be fitted with tight lids or, if rain-filled, tightly-fitted mesh screens can allow for rainwater to be harvested from roofs while keeping mosquitoes out.
Habitat of Lady Aedes

Drums (150–200 litres)

- Empty, Clear and scrub weekly
- Mosquito-proof cover
Habitat of Lady Aedes

Potted plants with saucers

• Empty, Clear and scrub weekly
Habitat of Lady Aedes

Animal water container

• Empty, Clean & Scrub weekly
Habitat of Lady Aedes

Discarded food and drink containers

• Collect, Recycle and Dispose of
Habitat of Lady Aedes

Hollow fence posts

- Modify design,
- Fill with sand, soil or concrete
Habitat of Lady Aedes

Discarded large appliances

• Collect, Recycle & Dispose of
Habitat of Lady Aedes

Discarded buckets
Habitat of Lady Aedes

Rock Holes

- Fill with sand, soil or concrete
Habitat of Lady Aedes

Defrosted Water in Fridge drain pan

• Empty, Clean and Scrub the container weekly

Water should drip down into pan and evaporate
Habitat of Lady Aedes

Water in water Coolers

- Empty and Clean
Solid Waste Management

• Solid Waste:-Mainly refers to non-biodegradable items of household, community and industrial waste.

• The basic rule of “reduce, reuse, recycle” is highly applicable
Habitat of Lady Aedes
Construction Sites
Fill, drain water
Street cleansing

- A reliable and regular street cleansing system that removes discarded water-bearing containers and cleans drains to ensure they do not become stagnant and breed mosquitoes will both help to reduce larval habitats of *Ae. aegypti* and remove the origin of other urban pests.
Individual and household protection

- Wear long sleeves and pants for additional protection that minimizes skin exposure during daylight hours when mosquitoes are most active.
- Repellents may be applied to exposed skin or to clothing.
- The use of repellents must be in strict accordance with label instructions.
- Insecticide-treated mosquito nets afford good protection for those who sleep during the day (e.g. infants, the bedridden and night-shift workers).
Individual and household protection

- Where indoor biting occurs, household insecticide aerosol products, mosquito coils or other insecticide vaporizers may also reduce biting activity.
- Make sure that the household fixtures such as window and door screens are secure and without holes.
- If available, use air-conditioning.
Protect Yourself

• If someone in your house is ill with dengue, take extra precautions to prevent mosquitoes from biting the patient and going on to bite others in the household.

• Sleep under a mosquito bed net, eliminate mosquitoes you find indoors and wear repellent!

• Repellents containing DEET, picaridin, oil of lemon eucalyptus or IR3535 as the active ingredient are recommended.

• Clothing impregnated with permethrin is an option (pre-treated or you can treat yourself)
Salient Feature on Diagnosis

- Typical symptoms as called break bone fever
- Physical examination
- Tourniquet Test

How to do a Tourniquet test

- The tourniquet test is performed by inflating a blood pressure cuff to a point mid-way between the systolic and diastolic pressures for five minutes. A test is considered positive when 10 or more petechiae per 2.5 cm² (1 inch) are observed. In DHF, the test usually gives a definite positive result (i.e. >20 petechiae). The test may be negative or mildly positive during the phase of profound shock.
Salient Feature on Diagnosis

- Changes in Haematocrit
- Depressed White Blood Cell count
- Decreased Platelet count (<1,00,000)
- Non-Structural Antigen (NS1) positive on 1\textsuperscript{st} or 2\textsuperscript{nd} day (suspect), confirm with Elisa.
- IgG and IgM (Rapid Test) usually becomes positive on day 4-5 of fever; confirm with Elisa
- Elisa Test positive
- Virus isolation
Salient Features on Treatment

Say No to:

• Pain killers that can cause stomach ulcers
• Injectables (both IM & IV)
• Antibiotics
• Blood Transfusion, unless specifically indicated

Say Yes to:

• Paracetamol for fever (Max. 3 times/24 hours)
• Platelet Concentrate (If, Platelet < 10,000)
• Platelet <50,000 with bleeding
Take Home Message

• Dengue may go un-noticed with mild symptoms
• Can be dangerous with DHF and DSS
• No vaccine is available at present
• No specific treatment is available
• It can be prevented
• Don’t give your blood to Aedes mosquito for successful ovulation and don’t provide shelter
• Kill the enemy from the beginning
• Report break bone fever immediately to doctor
• Don’t get panic
One Sentence Message

• Be a part of Swachh Bharat Mission of the Honorable Prime Minister of India to beat the Dengue’s ugly face.

Thank You

Acknowledgement:

WHO

CDC