DEFINITIONS

PROBABLE/SUSPECTED DENGUE: Children with sudden onset high-grade fever accompanied by facial flushing, skin erythema, generalized body ache, myalgia, arthralgia, retro-orbital eye pain, photophobia, rubelliform exanthema and headache. Some patients may have a sore throat, an injected pharynx, and conjunctival injection. Anorexia, nausea and vomiting are common. This acute febrile phase usually lasts 2–7 days. It can be difficult to distinguish dengue clinically from non-dengue febrile diseases in the early febrile phase. A positive tourniquet test in this phase indicates an increased probability of dengue. These clinical features do not predict the severity of disease. Therefore it is crucial to monitor for warning signs and other clinical parameters in order to recognize progression to the critical phase.

DENGUE AREA: During outbreaks, a specific area earmarked to cohort these children with suspected dengue to be monitored closely and give adequate oral rehydration and to do relevant investigations.

Box 1: MANAGEMENT OF CATEGORIES: (See algorithm next page)

<table>
<thead>
<tr>
<th>Group A1</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Send Home with information card in local language)</td>
<td>(Admission to Wards)</td>
<td>(Admission to High Dependency Unit /Paediatric ICU)</td>
</tr>
<tr>
<td>1. Dengue fever without warning signs and normal Hb and Platelets&gt;1 Lakh (EXCEPT High risk and social reasons)</td>
<td>All children needing IV Fluids - Volume Replacement Therapy (VRT)</td>
<td>Severe Dengue</td>
</tr>
<tr>
<td>Review them in OPD Q48H with Hb/platelets; earlier if there is any WS or any other concern</td>
<td></td>
<td>(Severe Plasma leakage, Severe Bleeding, Severe organ involvement)</td>
</tr>
<tr>
<td>2. Dengue fever without warning signs, with platelet count 50,000 to 1 Lakh (EXCEPT High risk &amp; social reasons)</td>
<td>Review them Q 24 hrly at Paed. ER or OPD with Hb,Platelets ; EARLIER if there is any WS</td>
<td></td>
</tr>
<tr>
<td>Group A2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Observe outside Emergency Room - DENGUE AREA )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. High risk children without warning signs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Children without warning signs with low platelets (&lt;50,000) + Stable /normal Hb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Children with social reasons/circumstances</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B2: (Admission inside Emergency Room – In Patient area (Short stay)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. All children – waiting for ward admission (on Volume Replacement Therapy -VRT) –have to be shifted within 8 -12hrs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Children with warning signs on oral hydration</td>
<td></td>
</tr>
</tbody>
</table>

Continued on page 45...
**Box 2: Dengue classification by severity**

**Dengue case classification by severity**

- **Dengue ± warning signs**
  - Without
  - With warning signs

- **Severe dengue**
  - 1. Severe plasma leakage
  - 2. Severe haemorrhage
  - 3. Severe organ impairment

**Criteria for dengue ± warning signs**

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

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

**Warning signs**

- Abdominal pain or tenderness
- Persistent vomiting
- Clinical fluid accumulation
- Nasal 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**

1. Severe plasma leakage leading to:
   - Shock (DSS)
   - Fluid accumulation with respiratory distress
2. Severe bleeding as evaluated by clinician
3. Severe organ involvement
   - Liver: AST or ALT >1000
   - CNS: Impaired consciousness
   - Heart and other organs

**Box 3: Course of Dengue illness**

<table>
<thead>
<tr>
<th>Days of illness</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
<td></td>
<td>40°</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential clinical issues</td>
<td></td>
<td></td>
<td></td>
<td>Dehydration</td>
<td>Shock bleeding</td>
<td>Reabsorption fluid overload</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory changes</td>
<td></td>
<td></td>
<td></td>
<td>Hematocrit</td>
<td>Platelet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serology and virology</td>
<td></td>
<td></td>
<td></td>
<td>Viraemia</td>
<td>IgM/IgG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course of dengue illness:</td>
<td></td>
<td></td>
<td></td>
<td>Febrile</td>
<td>Critical</td>
<td>Recovery phases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
QUICK ASSESSMENT IN Emergency Room

STEP I (overall Assessment)

1. Ensure presumptive diagnosis of Dengue

2. History:
   Date of onset of fever
   Oral intake?
   Warning signs
   Diarrhea

3. Physical Examination
   a. Tachypnoea, Resp. Distress
   b. Hydration , Signs of Perfusion : HR ,Pulses, BP – Pulse pressure
   c. Mental state
   d. Hepatomegaly , third spacing – ascites
   e. Rash, Bleeding manifestations

4. Lab: Baseline Hb, WBC, Platelets

STEP II: (Assessment of phase & severity)

1. Which phase? - Febrile, Critical or Recovery
2. Categorize the group: A, B, C
3. Does the patient need admission?
   If yes, where? - Inside Emergency, Wards, HDU /PICU

STEP III (Management Decisions)

1. Group A : Send home / Observe outside Emergency in DENGUE AREA
2. Group B : In-hospital management (inside Emergency In –patient area / WARDS )
3. Group C: Emergency resuscitation & admission to HDU /PICU

MONITORING : Q8H in non-shock patients (Dengue Area –outside Emergency Room)

* Look for ‘WARNING SIGNS’
* Check Vitals : - HR, CFT, peripheries, Pulse Volume, Urine Output, BP- pulse pressure
* Hb / Platelet Count Q24H

<table>
<thead>
<tr>
<th>(Box 4) <strong>HIGH RISK CHILDREN</strong></th>
<th><strong>WARNING SIGNS:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Young Children &lt; 2years</em></td>
<td><strong>Clinical:</strong></td>
</tr>
<tr>
<td><em>Obesity</em></td>
<td>1. Persistent Vomiting / Inability to drink</td>
</tr>
<tr>
<td><em>Congenital Heart Diseases/ Renal Diseases / Haemolytic Diseases / On steroids</em></td>
<td>2. Severe Abdominal Pain</td>
</tr>
<tr>
<td></td>
<td>3. Lethargy /Restlessness</td>
</tr>
<tr>
<td></td>
<td>4. Any mucosal bleed / petechial rash</td>
</tr>
<tr>
<td></td>
<td>5. Giddiness</td>
</tr>
<tr>
<td></td>
<td>6. Pale, cold and clammy hands and feet</td>
</tr>
<tr>
<td></td>
<td>7. Less/no urine output for 4-6 hours</td>
</tr>
<tr>
<td></td>
<td>8. Hepatomegaly (liver &gt;2cm)</td>
</tr>
<tr>
<td></td>
<td>9. Clinical fluid accumulation (edema, pleural effusion, ascites)</td>
</tr>
</tbody>
</table>

**Lab:** Increase in Hb/Hct + rapid decrease in platelets

**PLUS :**
*constant inconsolable cry in infants
*excessive thirst (dry mouth);
*difficulty in breathing.
MANAGEMENT PLAN FOR VOLUME REPLACEMENT THERAPY IN CHILDREN WITH WARNING SIGNS

Group B: Children with warning signs but NOT in shock

General Principles
1. Isotonic crystalloids should be used during the critical phase (NS or 5% DNS; if <6 months – ½ NS or ½ NS with 5% Dextrose)
2. In obese patients, ideal body weight should be used for calculation
3. Rate of IV administration should be adjusted according to the clinical situation
4. Prophylactic platelet transfusion NOT recommended. Even in the event of severe bleeding with low platelets, consider FFP and then platelets.

Rate of IV fluid infusion as follows:
8 ml /kg/hour for 1-2 hours, then reduce to 6 ml/kg/hour for 2-4 hours, then reduce to 4 ml/kg/hour for 24-48 hrs
This may be reduced further to fluid maintenance (according to Holliday and Segar formula) if vital signs stable and Hb / Hct are not rising. Plan to discontinue IV fluids in 48 hours.

Monitor
- Vital signs – BP, HR, RR, CRT, abdominal girth, Q2-4H
- Urine output Q4H
- Hb – Q8H, if hematocrit rising, titrate fluids accordingly
- Platelet count – Q24H
- Also, check Glucose, Electrolytes, Calcium, creatinine, liver enzymes, PT/PTT, Chest X-ray

Other Supportive measures
- Correct hypoglycemia and electrolyte /calcium abnormalities
- Inj. Vit. K1 if PT prolonged
- If severe bleeding with thrombocytopenia and other coagulopathy or a procedure to be done, consider blood products in the order of Packed Cells, FFP & platelet transfusion; If blood products are not available give whole blood; Avoid platelets alone.
- Antibiotics if bacterial infection/ Rickettsial infection is suspected

Children with warning signs PLUS compensated shock (systolic BP maintained but signs of reduced perfusion):

Initial IV infusion is given at 10 ml/kg/ hour over 1 hour.
With clinical improvement, reduce to 5-7 ml/kg/hour for 1-2 hours, then reduce as for children not in shock (above).
If no clinical improvement with initial IV infusion, start second IV bolus at 10-20 ml/kg/hour and repeat Hb / HCT to decide on need for packed cell transfusion / inotropic support in PICU.

Children with warning signs PLUS hypotensive shock (if systolic BP <5th percentile for age)

- Newborn < 60mm Hg
- Up to 1 yr. <70mmHG
- 1-10 yrs : 2 X Age (yrs) +70 mmHg
- >10 yrs : 90mmHg

Give initial IV bolus at 10 ml/kg over 15 minutes.
If improving, can continue further IV infusions as for compensated shock
If not improving, repeat IV boluses as needed and transfer to PICU

Oral rehydration therapy (ORT) for children without warning signs or with warning signs in the ER- IP area

<table>
<thead>
<tr>
<th>Body Weight (kg)</th>
<th>ORS to be given</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3-10</td>
<td>100 ml/kg/day</td>
</tr>
<tr>
<td>&gt; 10-20</td>
<td>75 ml/kg/day</td>
</tr>
<tr>
<td>&gt; 20-30</td>
<td>50-60 ml/kg/day</td>
</tr>
<tr>
<td>&gt; 30-60</td>
<td>40-50 ml/kg/day</td>
</tr>
</tbody>
</table>
MONITORING - Children with warning signs inside Emergency or in the WARD:

- Vital signs & signs of perfusion – Q2H
- Urine output - Q4H
- Blood glucose (infants /risk) –Q6H
- HCT – Q12H
- Platelets – Q24H
- Liver, renal, coagulation profile as indicated

INDICATION FOR PLATELETS, FFP & packed cells

- Platelets indicated only in severe bleed;
- Even in bleed, consider packed cells first
- **Prophylactic PLATELET transfusion is unnecessary even when counts are very low without bleeding or shock (risk of volume overload)**

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Box 6: **Algorithm for fluid management of compensated shock: in infants and children**

```
Compensated shock
(Systolic pressure maintained + signs of reduced perfusion)

Start isotonic crystalloid^ 10–20 ml/kg/hr for 1 hour

Yes

IMPROVEMENT*

IV crystalloid, reduce gradually 10 ml/kg/hr for 1–2 hours 7 ml/kg/hr for 2 hours 5 ml/kg/hr for 4 hours 3 ml/kg/hr

As clinical improvement is noted, reduced fluids accordingly

Further boluses may be needed for the next 24–48 hours

Stop IV fluids at 48 hours

No

HCT↑ or high

Check HCT

Crystalloid (2^st bolus) or colloid 10-20 ml/kg/hr for 1 hour

IMPROVEMENT*

Yes

Severe Overt Bleed

Colloid 10-20 ml/kg/hr

Evaluate to consider blood transfusion if no clinical improvement

No

HCT↓

Reduce IV crystalloids 7-10 ml/kg/hr for 1–2 hours

Urgent blood transfusion

^Colloid is preferable if the patient has already received previous boluses of crystalloid

*Reassess the patient’s clinical condition, vital signs, pulse volume, capillary refill time and temperature of extremities. IV = intravenous; HCT = haematocrit; ↑ = increased; ↓ = decreased
```
Box 7: Algorithm for fluid management in hypotensive shock – infants, children and adults

Normal range of vital signs in children (age related)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Heart Rate at rest</th>
<th>Respiratory Rate at rest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn (birth – 1 month)</td>
<td>100-180</td>
<td>40-60</td>
</tr>
<tr>
<td>Infant (1 – 12 months)</td>
<td>100-180</td>
<td>35-40</td>
</tr>
<tr>
<td>Toddler (13 months – 3 years)</td>
<td>70-110</td>
<td>25-30</td>
</tr>
<tr>
<td>Preschool (4 – 6 years)</td>
<td>70-110</td>
<td>21-23</td>
</tr>
<tr>
<td>School Age (7 – 12 years)</td>
<td>70-110</td>
<td>19-21</td>
</tr>
<tr>
<td>Adolescent (13 – 19 years)</td>
<td>55-90</td>
<td>16-18</td>
</tr>
</tbody>
</table>