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Dengue Virus: DF and DHF

Introduction

Dengue is the most prevalent mosquito-borne viral disease transmitted to people by the bite of an *Aedes* mosquito that is infected with a dengue virus. It cannot spread directly from person to person. The mosquito becomes infected with dengue virus when it bites a person who has dengue and can transmit the virus while biting a healthy person for about six days. Persons who were previously infected with one or more types of dengue virus are thought to be at greater risk for developing dengue haemorrhagic fever if infected again.

What Can be Done to Reduce the Risk of Acquiring Dengue?

There is no vaccine for preventing dengue. The best preventive measure for residents living in areas infested with *Aedes aegypti* is to eliminate the places where the mosquito lays its eggs, primarily the containers used to hold water. Items that collect rainwater or are used to store water should be covered or properly discarded. Pet and animal watering containers and vases with fresh flowers should be emptied and scoured at least once a week. This will eliminate the mosquito eggs and larvae and reduce the number of mosquitoes present in these areas. Proper application of mosquito repellents containing 20 - 30% DEET as the active ingredient on exposed skin and clothing decreases the risk of being bitten by mosquitoes.

Clinical Presentation

Classic Dengue Fever (DF)

It is an acute febrile illness accompanied by headache, retroorbital pain, and marked muscle and joint pains, which evoked the term "break-bone fever". Fever typically lasts for 5 - 7 days. Some patients display a biphasic (saddleback) fever curve, with the second febrile phase lasting 1 - 2 days. The febrile period may also be followed by a period of marked fatigue that can last for days to weeks. Gastrointestinal or respiratory tract symptoms may dominate the clinical picture in some patients. A rash usually appears 3 - 4 days after the start of the fever. Haemorrhagic manifestations occur commonly in patients with DF, and in rare cases can be life-threatening.

Laboratory Findings

Laboratory findings typical of DF include the following:

- Leukopenia, Thrombocytopenia (platelet counts <100,000 cells/mm^3), Serum aspartate transaminase (AST) levels frequently elevated; the elevations are usually modest (2 - 5 times the upper limit of normal values), but marked elevations (5 - 15 times the upper limit of normal) are occasionally noted.
- IgM immunoassay (MAC-ELISA or equivalent) done on acute phase serum plasma sample is the procedure of choice for diagnosis.

Dengue Haemorrhagic Fever:

Dengue haemorrhagic fever (DHF) is the most serious manifestation of dengue virus infection and can be associated with shock. The four cardinal features of DHF as defined by the World Health Organization (WHO), include:

1. Increased vascular permeability (plasma leakage syndrome) evidenced by haemoconcentration (20 % or greater rise in haematocrit above baseline value), pleural effusion, or ascites.
2. Marked thrombocytopenia (less than 100,000 cells/mm^3).
3. Fever lasting 2 to 7 days.
4. A haemorrhagic tendency or spontaneous bleeding.

The presence of intense abdominal pain, persistent vomiting, sudden change from fever to hypothermia, and marked restlessness or lethargy should alert the clinician to possible impending dengue shock syndrome.

Patient Follow Up and Treatment

Outpatient Triage

- No haemorrhagic manifestations and patient is well-hydrated: home treatment may be adequate.
- Haemorrhagic manifestations or hydration borderline: admit in outpatient observation center or hospitalise.
- Any warning signs (even without profound shock) or DSS: hospitalise.

Indications for Hospital Admission

Referral for hospitalisation should be made only for one of the following signs:

- Blood pressure < 90/60 mmHg.
- Haematocrit > 50 %.
- Platelet count < 50,000/mm^3.
- Evidence of bleeding other than petechiae.

Indications for Hospital Discharge

- Absence of fever for 24 hours (without anti-fever therapy) and return of appetite.

- Visible improvement in clinical picture.
- Stable Haematocrit.
- Three days have passed after recovery from shock.
- Platelets ≥ 50,000/mm^3.
- No respiratory distress from pleural effusions/ascites.

Treatment of Dengue Fever

- Fluids, rest, Antipyretics (avoid aspirin and non-steroidal anti-inflammatory drugs).
- Monitor blood pressure, haematocrit, platelet count and level of consciousness. Serial haematocrits and platelets should be taken for patients with bleeding manifestations at least daily until temperature stays normal for 1 - 2 days. All the patients' blood sample should be taken in the first five days after the onset; convalescent sample should be taken between days 6 – 30.
- Platelet transfusions are rarely given, but may be warranted in patients with severe thrombocytopenia (<10,000/mm^3) and active bleeding.
- Oral rehydration may be sufficient in mild cases, particularly when medical attention is received early.

Adapted from Guidelines for Treatment of Dengue Fever/ Dengue Haemorrhagic Fever in Small Hospitals, WHO, 1999

Calculation of Maintenance Volume for Rehydration:

If there is any suspicion of dehydration, provide IV fluids, guided by serial haematocrits, blood pressure and urine output monitoring. The volume of fluid needed is similar to that used in the treatment of diarrhoea with mild to moderate isotonic dehydration (5%-8% deficit). For patients **over 40kg,** formula for calculating volume to correct dehydration is twice the recommended maintenance requirement i.e. [1500 + 20 x (weight in kg - 20)] x 2. For patients weighing **less than 40 kg,** following chart can be used as a reference:

Fluid for Moderate Dehydration

weight in kgs	ml/kg/day (IV)
< 7	220
7 - 11	165
12 – 18	132
19 - 40	88

Treatment of Shock:

World Health Organization (WHO) recommends that for patients with shock, an initial bolus of D5W in normal saline or Ringer's lactate (10 to 20 ml/ kg of body weight) should be infused rapidly, followed by continuous infusion (10 to 20 ml/kg/hour) until vital signs and urine output normalise. The infusion rate can then be gradually reduced until it matches plasma fluid losses.

Facts About Immunisation

Active immunisation of a vaccine or toxoid stimulates the host to produce a primary immune response. Vaccines used for active immunization are derived from whole killed bacteria, live attenuated bacteria or viruses, or antigenic subunits of organisms. Vaccines recommended for healthy adults are the pneumococcal, influenza, hepatitis B, MMR, varicella, and hepatitis A vaccines. Toxoids used for active immunisation are bacterial toxins that are modified to render them nontoxic by inducing the formation of antitoxin antibody. Toxoids recommended for healthy adults are tetanus and diphtheria toxoid.

Passive immunisation involves administration of antibodies (as parenteral immune globulin, derived from pooled human serum or antitoxin derived from serum harvested from immunised animals). This immunisation offers short-term protection to people who have been or will be exposed to a specific pathogen and is typically used by immunocompromised patients who are unable to produce an effective immune response with active immunisation.

Limitations of Co-administration of Vaccines

Live virus vaccines should either be administered on the same day, or subsequent immunisation with live virus vaccines should be delayed one month to avoid the theoretical concern that the immune response to one or both might be impaired.

Immune globulins should not be administered along with live virus vaccines because the passively administered antibodies can interfere with the vaccine response (this limitation does not apply to inactivated vaccines or on oral polio and yellow fever vaccines). If administration of immune globulin (or blood products containing significant amounts of immune globulin) becomes necessary within 14 days of administration of MMR, either vaccination antibody titers should be checked to ensure that the MMR vaccine was effective or the

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