MALARIA
FACTS

• Approximately 2.48 million malaria cases are reported annually from South Asia.

• Of Which 75% cases are contributed by India alone.

• The magnitude of the problem is further enhanced by P falciparum resistance to standard antimalarial drugs adding to increased morbidity and mortality.
Malaria Endemic Countries

Note: This map shows countries with endemic malaria. In most of these countries, the malaria risk is limited to certain areas.
LIFE CYCLE OF MALARIAL PARASITE
LIFE CYCLE OF MALARIAL PARASITE
PATHOPHYSIOLOGY

• Cytoadherence –
  – Infected RBCs become sticky and adhere to venular and capillary endothelium due to HISTIDINE RICH PROTEIN (HRP)

• Sequestration –
  – RBCs disappear from blood and is sequestered in the venules, greatest in the brain

• Rosetting
  – Infected RBCs adhere to uninfected RBCs.
CLINICAL MANIFESTATION

Incubation Period

- P. Falciparum: 9-14 days.
- P. Vivax: 12-17 days.
- P. Ovale: 16-18 days.
- P. Malariae: 18-40 days.
SYMPTOMS ASSOCIATED WITH FEBRILE PAROXYSMS

• High fever.
• Rigors.
• Sweats.
• Head ache.
• Myalgia.
• Nausea.
• Vomiting.
• Jaundice.
NON IMMUNE CHILDREN >2 MONTHS

• Low Grade Fever.
• Head Ache.
• Drowsiness.
• Splenomegaly.
• Hepatomegaly.
• Anemia.
• Thrombocytopenia.
• Normal Or Low WBC Count.
GENERAL DANGER SIGNS OF MALARIA

• Not able to drink or breast feed.
• Vomiting everything.
• Recent history of convulsion.
• Lethargic or unconscious state.
• Unable to sit or stand up.
COMPLICATIONS

- Cerebral malaria
  - *P. falciparum*
  - Usually develops after several days
  - Fatality rate of 20–40%
  - More among patients with parasitemia of >5%.
  - Decreased level of consciousness
  - From drowsiness and severe headache to confusion, delirium, hallucinations, or deep coma.
COMPLICATIONS

• Cerebral malaria
  – Fever - 106–108°F,
  – Seizures
  – Retinal haemorrhages
  – hemiplegia

• Lumbar puncture
  – Increased Pressure and CSF protein
  – Minimal or no cells, Normal glucose
COMPLICATIONS

Blackwater fever

– *P. falciparum*

– Severe haemolysis → Haemoglobinuria

– Deposition of haemoglobin in renal tubules → Acute tubular necrosis.
  → Renal failure.

– Peritoneal dialysis or haemodialysis.
COMPLICATIONS

• Pulmonary oedema
  – Several days after therapy
  – Commonly associated with excessive IVF
  – Care to be taken not to overhydrate
• Hypoglycaemia
  – More common in children, pregnant women, and patients receiving quinine therapy.
  – Symptoms - may be confused with cerebral malaria
  – Increased mortality and neurologic sequelae.
COMPLICATIONS

• Thrombocytopenia
  – *P. falciparum* and *P. vivax*
  – Can decrease to 10,000–20,000/mm$^3$. 
COMPLICATIONS

• Splenic rupture
  – Rare complication
  – Trauma – vigorous palpation
  – Severe internal haemorrhage
COMPLICATIONS

- Algid malaria (Algid = Cold)
  - *P. falciparum*
  - May be secondary gram negative bacteremia
  - Hypothermia
  - Hypotension, Rapid weak pulse
  - Shallow breathing
  - Pallor
  - Vascular collapse.
  - Death may occur within a few hours.
COMPLICATIONS

• DIC
• Metabolic acidosis
• Jaundice - hemolysis, hepatic dysfunction, cholestasis
• Hyperkalemia
• Typhoid
• Leptospirosis
• Pneumonia
• Hepatitis
• Influenza
• Meningitis
• Encephalitis
• Pyelonephritis
• Tuberculosis
• Amoebic liver abscess
• Collagen vascular disease.
MICROSCOPIC DIAGNOSIS OF MALARIA

• Uncomplicated malaria -
  – Before commencing treatment - diagnosis to be established

• Complicated malaria –
  – Presumptive treatment may be started in cases of with danger signs
• Light microscopy - thick and thin blood films –
  – Gold standard for malaria diagnosis
  – Time consuming, requires skilled person
• A minimum of 100 fields should be examined before concluding the slide to be negative
• Can be repeated 2-3 times a day in a suspected case.
STAINED THICK AND THIN BLOOD FILMS

• Thick films is for the detection of the plasmodium.
• Thin film is for the identification of the types of plasmodium
STAINED THICK AND THIN BLOOD FILMS
QUANTITATIVE BUFFY COAT (QBC)

- Stained with Acridine Orange, centrifuged, and visualized under fluorescence Microscopy
RAPID DIAGNOSTIC TESTS (RDTs)

- Histidine rich protein II (HRPII) : (Para Sight F test)
  - *P. falciparum*
  - Rapid
  - Sensitive and Specific
- Parasite lactate dehydrogenase (pLDH) : (Optimal Test)
  - Produced by all 4 species of plasmodium
- Molecular probes, polymerase chain reaction (PCR)
- Serology
RAPID DIAGNOSTIC TESTS (RDTs)

• Immunochromatographic tests to detect plasmodium specific antigen.
• Permit on spot confirmation of malaria even at the periphery.
• Benefits.
  – Initiation of treatment
  – Avoidance of unnecessary treatment.
  – Delay in progress of drug resistance.
MANAGEMENT OF UNCOMPLICATED MALARIA

• Presumptive treatment of malaria-

• Uncomplicated malaria should be treated after diagnosis by microscopic examination or rapid diagnostic tests or both

• Complete and successful antimalaria therapy is only possible when the parasite is identified.
Management of uncomplicated malaria contd..

• Major problem:
  • Development of resistance of *P. falciparum* to the first line drug chloroquine in certain areas of our country.

• This resistance is reported from 44 districts of 18 states of India.

• Chloroquine resistant *P. vivax* cases are also emerging as seen in a few reports.
CHLOROQUINE RESISTANT P FALCIPARUM:
228 PHCs, 44 DISTRICTS, 18 STATES
MANAGEMENT OF UNCOMPLICATED MALARIA CONT'D

• Chloroquine sensitive malaria cases
  – 25mg/kg in 3-4 divided doses in 48 hours.

• Primaquine is to be used in G6PD non-deficient cases for radical cure prophylaxis.
ACT-SPTREATMENT OF UNCOMPLICATED P.FALCIPARUM CASES

1. Artemisinin based Combination Therapy (ACT-SP)*

   - Artesunate 2.4 mg/kg daily for 3 days Plus
   - Sulfadoxine (25 mg/kg) -
   - Pyrimethamine (0.25 mg/kg) on first day.

2. Primaquine*: 0.75 mg/kg on day 2.
MANAGEMENT OF UNCOMPLICATED MALARIA CONT..

In multidrug resistant P falciparum,

• Quinine 10mg salt/kg/dose, 3 times daily for 7-10 days.
• In case of cinchonism, - 3-5 days along with tetracycline or doxycycline for 7-10 days.
• < 8 years - tetracycline or doxycycline should be replaced by clindamycin.
• A single dose of primaquine above one year of age.
ANTI-MALARIA CHEMOTHERAPY OF SEVERE AND COMPLICATED MALARIA

• Severe malaria is usually always due to P falciparum.

• Treated as medical emergency

• Preferably in intensive care setting.
ANTI-MALARIA CHEMOTHERAPY OF SEVERE AND COMPLICATED MALARIA CONT'D..

• Progression to cerebral malaria - very rapid in children.

• Effective treatment in severe malaria in children includes anti-malarials, supportive management and management of complications.
SUPPORTIVE MANAGEMENT OF COMPLICATED AND SEVERE MALARIA

- Nasogastric tube for unconscious child
- Oxygen therapy and respiratory support when needed
- Anticonvulsive therapy with diazepam/midazolam
- Treatment of hyperpyrexia
- Close monitoring of vital signs
- Measurement of parasite count time to time
PROGNOSIS OF COMPLICATED AND SEVERE MALARIA

• Poor prognosis is suggested if more than 5 % of RBC are infected or parasite density is above 25000/ml

• The prognosis worsens if more than 20% parasite contain pigment.
DRUGS FOR SEVERE AND COMPLICATED MALARIA

• Quinine salt 20mg/kg (IV infusion or divided IM) followed by maintain dose of 10mg/kg 8 hourly.

• Infusion rate should not exceed 5mg salt/kg/hr.

• Loading dose of quinine may not be given if the patient has already received quinine.
Artesunate:
• 2.4 mg/kg i.v. or i.m. given on admission (time=0), then at 12 h and 24 h, then once a day for 7 days.

Or

Artemether:
• 3.2 mg/kg i.m. given on admission then 1.6 mg/kg per day for seven days.
SOME DON'T’S IN SEVERE MALARIA CASE MANAGEMENT

Do not use

• Corticosteroids,
• Intravenous mannitol,
• Heparin as anticoagulant,
• Adrenaline
• Overhydrate
CHEMOPROPHYLAXIS

• Only in selective grips in high *P. falciparum* endemic areas.

• Insecticide Treated bed Nets (ITN) / Long Lasting Insecticidal Nets (LLIN) should be encouraged.

• Chemoprophylaxis should be followed wherever appropriate e.g. troops on night patrol duty and decisions of their Medical Administrative Authority.
CHEMOPROPHYLAXIS

Short term chemoprophylaxis (up to 6 weeks)
Doxycycline :
• 100 mg once daily for adults and
• 1.5 mg/kg once daily for children
  • (contraindicated in children below 8 years).
• started 2 days before travel and continued for 4 weeks after leaving the malarious area.

Note : It is not recommended for pregnant women and children less than 8 years
CHEMOPROPHYLAXIS

Chemoprophylaxis for longer stay (more than 6 weeks)

Mefloqiune:
• 250 mg weekly for adults and
• 5 mg/kg for children
• once a week
• 2 weeks before, during and 4 weeks after exposure.

Note: Contraindicated in individuals with h/o convulsions, neuropsychiatric problems and cardiac conditions. Therefore, necessary precautions should be taken and all should undergo before prescription of the drug.
Thank You