Malaria

Dr Piyush Tailor
Associate Professor
Government Medical College
Surat
• Vector-borne infectious disease
• **Caused** by protozoan parasites.
• **Transmitted**
  • Bite from an infective female Anopheles mosquito.
  • Anopheles must be infected through a previous blood meal taken from an infected person.
Four type of Protozoan parasites

1. Plasmodium falciparum
   • most common
   • deadly type of malaria infection
   • can lead to cerebral malaria

2. Plasmodium vivax
   • most common
   • causes relapse if treatment was not completed

3. Plasmodium ovale.

4. Plasmodium malaria
Life cycle of Plasmodium Parasite

1. Asexually Cycle in Man
2. Sexual Cycle in Anophelus Mosquito
Asexual Cycle in Man

- **Liver Stage.**
  - Mosquito bite and inject infected saliva
  - **Sporozoites** enter the circulatory system
  - within 30-60 minutes will invade a liver cell.
  - In hepatocyte, single “**Sporozoites**” converted to
    - multiple “**Schizonts**” and
    - later to multiple “**Cryptozoits**”.
  - Which burst hepatic cell and comes out from hepatocyte.
  - Cryptozoits can infect another neighbouring hepatocyte.
  - This replicative stage is called **Pre-erythrocytic schizogony**.
  - After multiplication, Cryptozoits release in blood in form of **Metacryptozoits**
Asexual Cycle in Man

- In *P. vivax* and *P. ovale*, some of the sporozoites do not immediately undergo asexual replication.
- Few enter into a dormant phase – “Hypnozoite”
- Hypnozoite at later time
  - Reactivate and undergo schizogony
  - Resulting in a relapse.
Asexual Cycle in Man

- **Blood Stage.**
  - **Metacryptozoits** enter RBC.
  - Metacryptozoits converted to **Trophozoits**
  - The **trophozoits (ring form)** ingests the host cell cytoplasm and breaks down the hemoglobin.
  - A by-product of the hemoglobin is the malaria pigment - **hemozoin (golden-brown to black granules)**
  - After 48 hours, it converted and release as Merozoites
  - Merozoites may invade again new Hepatocyte & new RBC.
  - Repeat erytrocytic cycle.
  - After Several erythrocytic cycle, Merozoites develop in to **Gametaocyte**.
Sexual Cycle in Anophelus Mosquito

- Female anopheles mosquito bite to infected person.
- All stage of parasite in enter in mosquito stomach.
- In stomach, all the stage of parasite get digested except Gametocyte.
- Gametocyte develop in Spozoit in mosquito.
*P. vivax*

- Ring form
- Mature ring form
- Trophozoite
- Trophozoite
- Early schizont
- Schizont
- Mature schizont
- Developing gametocyte
- Female gametocyte
- Male gametocyte
P. falciparum

- marginal form
- ring form
- double dotted rings
- ring form
- young trophozoite
- trophozoite
- early schizont
- schizont
- mature schizont
- female gametocyte
- male gametocyte
P. malariae

- Ring form
- Early band form
- Band form
- Early schizont
- Mature schizont
- Female gametocyte
- Male gametocyte
P. ovale

- young ring
- older ring
- comet form
- trophozoite
- trophozoite
- young schizont
- schizont
- mature schizont
- female gametocyte
- male gametocyte
Clinical Features

- Some time – Flu like symptoms
- High Grade Fever With Chills
  - Cyclic Presentation
  - Coldness - Shivering – Fever - Sweating
  - In P. Vivex - Classically Alternate day Fever
  - In P. Falciparum – Continues Fever
- Headache
- Joint pain
- Hepatomegally
- Spleenomegally
Complication

• Severe anaemia.
• Haemolytic Jaundice
• Blackwater Fever – Renal Failure
• Cerebral malaria
• Respiratory distress
  – pulmonary oedema
  – Pneumonia
• Coagulopathy – Bleeding tendency
• Shock
Black water fever

- Due to *P. falciparum*
- Massive intravascular hemolysis
- Severe acute hemolytic anemia
  - Hemoglobinuria
  - Increase in bilirubin
- Acute tubular necrosis
- Acute Renal Failure
Diagnosis

• Peripheral Blood Smear Examination
  – Thick Smear Examination
  – Thin Smear Examination

• Antibody Test –
  – IgM Antibody for P. Vivex
  – IgM Antibody for P. Falciparum

• PCR
Investigation to evaluate complication

- To know extent of hemolysis
  - Hemoglobin
  - Serum LDH
  - Serum Billirubin

- To evaluate renal involvement
  - Serum Creatinine
  - Serum electrolyte

- To evaluate liver involvement
  - Serum ALT
  - BT, CT, APTT
  - Blood Glucose

- To know metabolic alteration
  - Arterial Blood Gas Analysis

- To know pulmonary involvement
  - X-ray Chest
Management

- **Quinine & Chloroquine**
  - Found resistance now

- **Artemisinins derivatives (Artemether & Arteether)**
  - In combination with other antimalarials
  - Artemisinin-combination therapy = ACT

- **Lumefantrine / Mefloquine / Sulfadoxine + Pyrimethamine**

- **Treatment of *P. vivax***
  - Treatment of blood stages = Chloroquine or ACT
  - Clearance of liver forms = Primaquine

- **Treatment for severe malaria** = I.V. use of antimalarial drugs
  - Parenteral artesunate is superior to quinine

- **Treat malaria during pregnancy**, the WHO recommends,
  - 1\textsuperscript{st} trimester = Quinine + Clindamycin
  - 2\textsuperscript{nd} & 3\textsuperscript{rd} trimesters = ACT
Management
Adjuvant Therapy

• **NSAID**
  – For fever

• **Proton Pump Inhibitor**
  – Omerazole / Pantoprazole
  – Prevent gastritis due anti-malarial drugs

• **Glucose**
  – Prevent hypoglycemia due to malaria as well as antimalarial drugs

• **Plenty of Fluid**
  – Prevention of renal toxicity
  – Prevent black water fever
  – Help to ease excretion of hemoglobin
Prevention

• Mosquito Net
• DDT spray
• Repellant
• Water management
  – Guppi fish
  – Oil cover on water
• Medical management
  – Chloroquine (300 mg base) once in week