GENERAL

Malaria - " Understanding the disease "

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What is Malaria

Malaria is a serious and sometimes life-threatening disease caused by a protozoan parasite “Plasmodium” , transmitted to people through the bites of infected female Anopheles mosquitoes.

"malaria" is an Italian word, where "mal" means "bad" and "aria" means "air"; this is because the disease was historically associated with swampy areas and the belief that disease could be spread through "bad air" or miasma.

Cause of Malaria

There are primarily four species of the genus Plasmodium ,which can cause disease in humans:

1. Plasmodium falciparum .

2. Plasmodium vivax.

3. Plasmodium ovale .

4. Plasmodium malariae

Vector - Female Anopheles mosquito more than 45 species of Anopheles mosquito are identified)

Vulnerable Population

1. Infants and children: They haven't developed immunity to malaria yet.

2. Pregnant women: Pregnancy alters immunity, especially during the first and second pregnancies.

3. Travelers: They may lack immunity if they're coming from areas with little or no malaria transmission.

4. People with HIV or AIDS: They are at higher risk of malaria due to immunocompromised state.

5. Other risk factors Age, Socioeconomic factors, Environmental factors, and Occupation.

Geographical distribution

• The majority of malaria cases occur in tropical and subtropical areas around the world, particularly in sub-Saharan Africa ,Central and South America ,Southeast Asia , and India.

• Warm temperatures and high humidity, typical of tropical climates, create suitable environments for the breeding of infected mosquito vectors .

Mode of Transmission

1. Vector borne -Bites of female anaoheles mosquitoes

2. Direct -blood transfusion , drug addicts (shared use of needles/syringes) ,

3. Congenital malaria'- infected mother may also pass malaria on to her baby during delivery (birth).

Incubation Period

The incubation period for malaria is the time between being bitten by an infected mosquito and the first symptoms appearing

• **P. falciparum**: 7 to 14 days. This species causes the majority of severe malaria cases.

• **P. vivax and P. ovale**: 12 to 18 days, but can be longer.

• **P. malariae**: 18 to 40 days

Pathogenesis

The malaria life cycle involves two hosts: the human and the mosquito.

Human Host -Asexual cycle in Humans

1. Sporozoites: An infected female Anopheles mosquito bites a human, injecting sporozoites into the bloodstream.

2. Liver stage: Sporozoites travel to the liver, where they multiply and develop into merozoites.

3. Erythrocytic stage: Merozoites enter the bloodstream, infecting red blood cells (RBCs) and multiplying.

4. Schizont stage: Infected RBCs rupture, releasing more merozoites, which infect other RBCs.

5. Gametocyte stage: Some infected RBCs develop into gametocytes, the sexual stages of the parasite.

Mosquito Host- Sexual cycle in Mosquitoes

1. Gametocytes: An infected mosquito feeds on human blood, ingesting gametocytes.

2. Zygote formation: Male and female gametocytes fuse, forming a zygote.

3. Ookinate formation: The zygote develops into an ookinete, which penetrates the mosquito's midgut wall.

4. Oocyst formation: The ookinete transforms into an oocyst, which grows and multiplies.

5. Sporozoite formation: The oocyst ruptures, releasing sporozoites, which migrate to the mosquito's salivary glands.

RECURRENT MALARIA

Relapse commonly occurs between 8–24 weeks and is commonly seen with P. vivax and P. ovale infections.

Clinical Features of Malaria

Stages of Malria

The three stages of a malaria paroxysm are:

• **Cold stage**: A sudden feeling of cold that lasts 15–60 minutes

• **Hot stage**: A fever that lasts 2–6 hours and can reach 41°C

• **Sweating stage**: A fever that drops rapidly with profuse sweating, and extreme fatigue and lasts 2–4 hours

Malaria paroxysm frequency

• In P. vivax and P. ovale malaria, fever occurs every 48 hours

• In P. malariae disease, fever occurs every 72 hours

• In P. falciparum malaria, fever may occur every 48 hours, but is usually irregular

Malaria paroxysms occur when many infected blood cells burst at the same time.

Complications of Malaria

• Dehydration

• Acute renal failure

• Liver damage

• G.I symptoms

• Anemia

• cerebral malaria

• Black water fever

DIAGNOSIS

Malaria Diagnostic Tests

• Microscopic examination of blood films is the gold standard for laboratory confirmation of malaria parasites.

• A Rapid Diagnostic Test (RDT) are based on detection of circulating parasite antigens .

• Serological tests are based on detecting malarial antibody by fluorescent antibody tests.

• PCR can help identify the *Plasmodium* species

Treatment

1. Antimalarial medications: Artemisinin-based combination therapies (ACTs) are the most effective.

2. Chloroquin, Mefloquin , Quinine, proguanil etc

2. Supportive care: Rest, hydration, and management of symptoms.

PROGNOSIS OF MALARIA

When properly treated, patient with malaria can usually expect a complete recovery. However, severe malaria can progress extremely rapidly and cause death within hours or days. In the most severe cases of the disease, fatality rates can reach 20%, even with intensive care and treatment.

Over the longer term, developmental impairments have been documented in children who have suffered episodes of severe malaria.

Prevention

1. Insecticide-treated bed nets (ITNs): Use ITNs to prevent mosquito bites.

2. Indoor residual spraying (IRS): Spray insecticides indoors to kill mosquitoes.

3. Wearing protective clothing: Wear long-sleeved shirts, long pants, and socks.

4. Applying insect repellents: Use DEET, picaridin, or oil of lemon eucalyptus.

5. Eliminating stagnant water around homes to prevent mosquito breeding

Public Awareness

1. Awareness among general public is a crucial step in preventing and controlling malaria

2. Educational Campaigns involving various community programs, posters& banners and use of social media will help people in recognizing the early symptoms of malaria

3. Education can also inform people to cover over areas of stagnant, still water e.g. Water Tanks which are ideal breeding grounds for the parasite and mosquito, thus cutting down the risk of the transmission between people.

4. World malaria Day - Celebrated on 25 th April to raise public awareness and promote malaria prevention

Competing interests

The authors declare that they have no competing interests.

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