Malaria

Objectives

1. Understand the epidemiology and global burden of malaria
2. Define modes of transmission, clinical features, risk factors, community diagnosis and treatment of malaria
3. Enlist factors responsible for antimalarial drug resistance
4. Understand the role and measures taken by WHO to combat the burden of Malaria globally
5. Understand the epidemiology and risk factors related to Malaria in KSA
6. Enlist the global measures of prevention and elimination for malaria.

Resources slides and Doctors notes

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Important | Notes | Extra

Editing file - Feedback

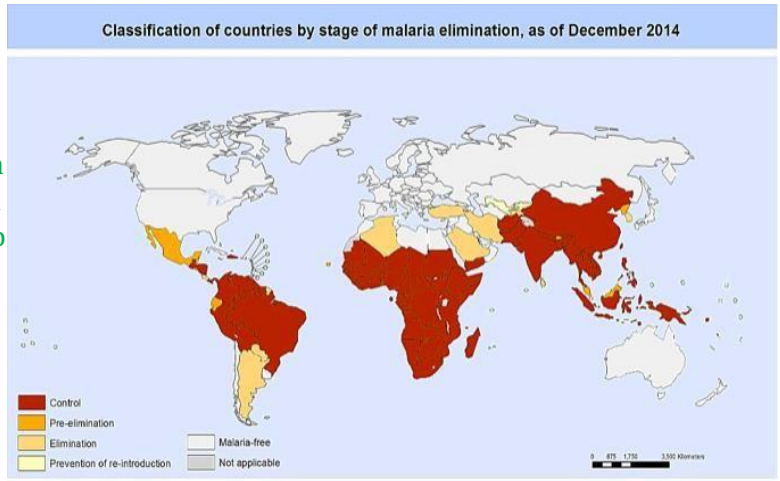
What is malaria?

Malaria is a life-threatening disease caused by **Plasmodium parasites(causative agent)** that are transmitted to people

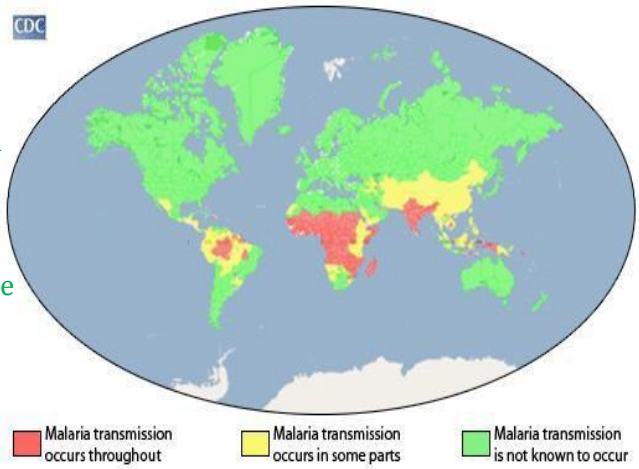
through the **bites of infected mosquitoes (vector: anopheles mosquitoes)**and it's responsible for approximately 1-3 million deaths per year.

Epidemiology

- In 2016, there were 216 million cases and 445,000 deaths caused by malaria worldwide.
- Between 2000 and 2015, malaria **incidence** fell by 37% globally.
- During the same period, malaria **mortality** rates decreased worldwide by 60% among all age groups, and by 65% among children under 5.
- In 2014, 13 countries reported zero cases of the disease and 6 countries reported fewer than 10 cases.



- ➔ Density of infection
- ➔ Darker color indicate more cases of malaria
- ➔ red > control: large number of cases
- ➔ Pre-elimination: less cases near to elimination
- ➔ مناطق استوائية the weather such as humidity and pond: mosquitoes will have proper weather to multiply
- ➔ Most cases of malaria are in : south America, south africa and south asia.
- ➔ elimination: they don't have cases
- ➔ saudi arabia is in the elimination phase, meaning we don't have high amount of cases,



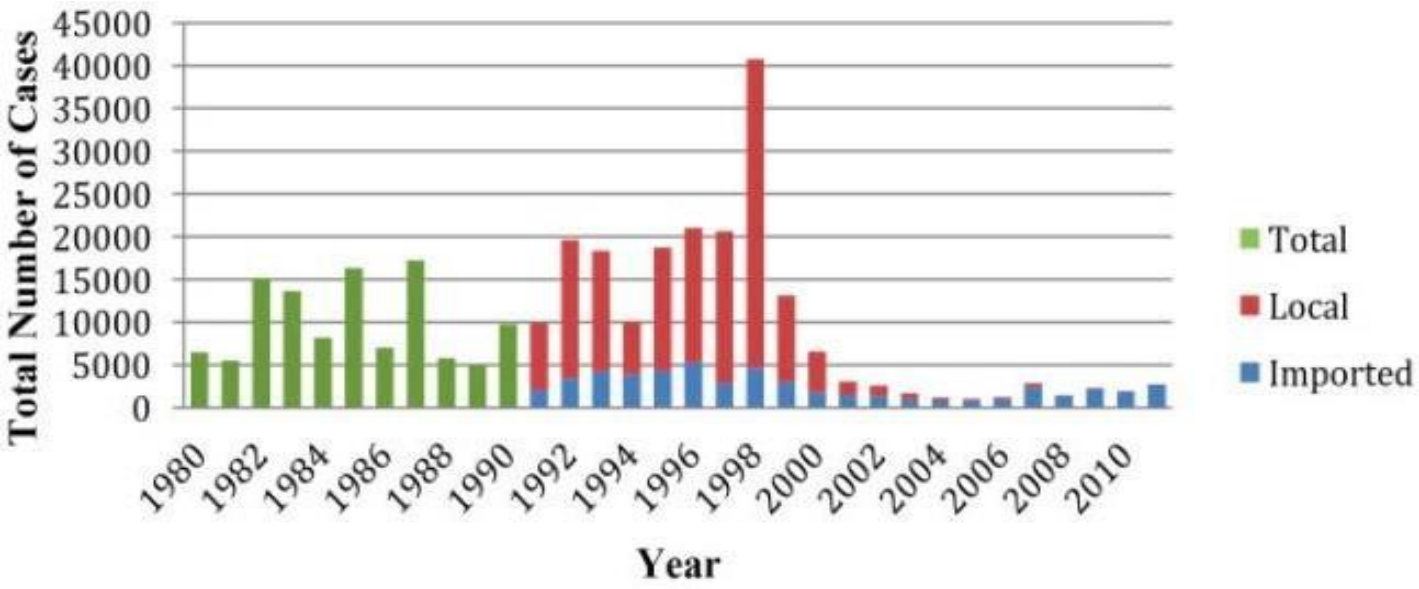
- ➔ Green color doesn't mean the incidence rate, it talks about transmission. How many transmission happen from the vector?
- ➔ saudi arabia is green, meaning that there is no transmission. that doesn't mean we don't have cases because we do have cases, but must of the cases come from uproad.
- ➔ yellow have medium transmission.
- ➔ in the whole world falciparum and vivax both of them are common.

Malaria in Saudi Arabia

- Areas at the **southern region** are at risk of malaria transmission, specifically Asir and Jizan. The Dominant Malaria Species in Saudi Arabia is **P. Falciparum.** humidity is perfect for the growth of the vector.

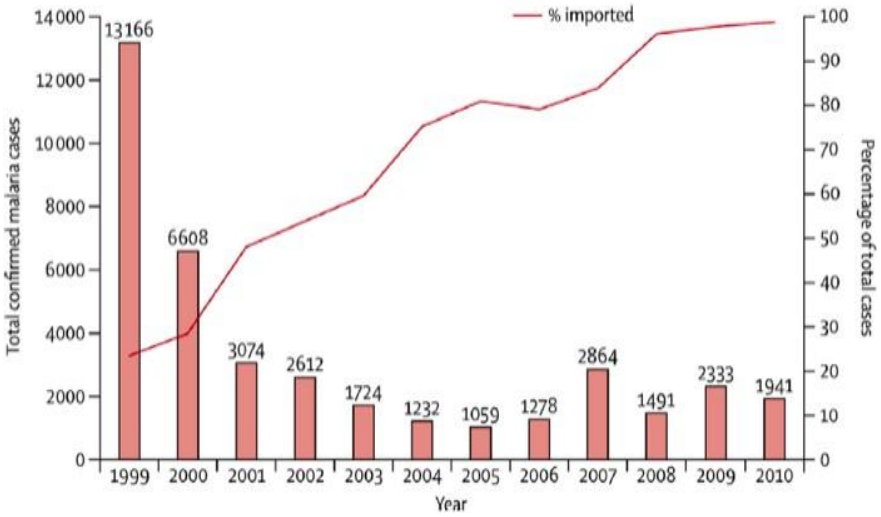
  Saudi Arabia achieved a decrease in malaria cases and case incidence rates of ≥75%. in the other hand in the whole world it was only decreased by 37%.

  The part below the doctor didn't mention.
- Malaria outbreak in 1998.
- Since then, only a few cases were reported
- In 2012, only 82 cases of malaria were reported..
- The proportion of imported malaria has increased from 23% to 99% of total detected cases.



Indigenous cases of malaria Saudi Arabia 2014

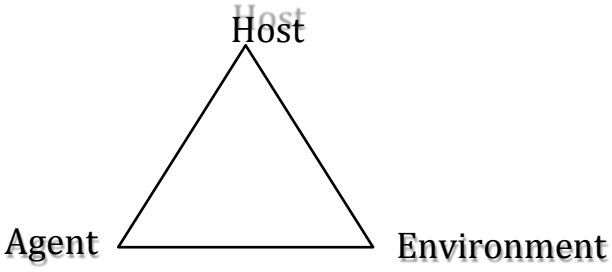
- ➔ Incidence of malaria has decreased by 75%
- ➔ last outbreak that was huge in Saudi was in year 1998.
- ➔ Most of the cases were local as you can see in the red color which indicate local cases, which means the transmission happen in same area, mosquitoes were in same area affected the person here and he had the case.
- ➔ Red color indicate local cases.
- ➔ after year 1998, they had decreased incidence in massive way and most of the cases were imported.
- ➔ 90% of malaria cases diagnosed in saudi arabia are imported.
- ➔ 80-90 cases are local cases only
- ➔ imported cases were less than quarter of the total cases, like in 1998, but nowadays 99% of cases are imported.
- ➔ green: they didn't differentiate between local and imported case.
- ➔ for ex. if we have long time ago 1000 case 250(1/4) will be local +(3/4) 750 will imported. nowadays if we have 100 cases all of it could be imported, 2-3 of them are local.



Imported malaria in Saudi Arabia 1999-2010

Imported malaria: via asymptomatic travelers from malaria endemic areas, sustains a threat for possible resurgence of local transmission: Workers, immigrants, pilgrims.

Analytical Epidemiology Triad:



important:
host in malaria : human
agent in malaria: plasmodium parasite
vector: mosquitoes
enviroment: humidity, stagnant water, mosqitues rate, cases rate, povierty.

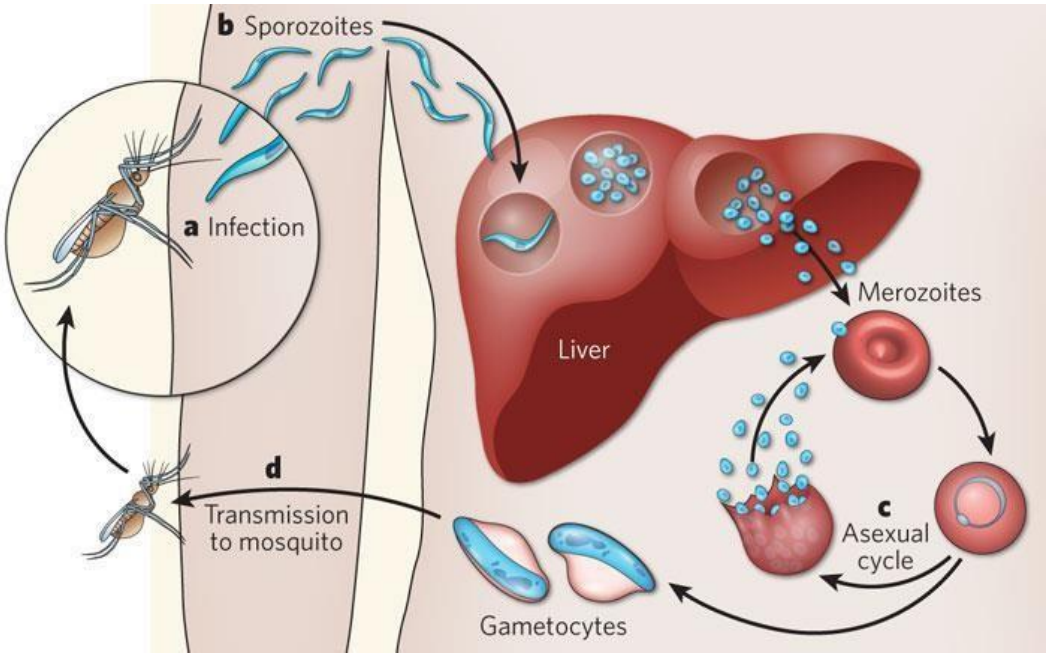
Plasmodium Parasites

- Five species cause malaria in humans:
  Plasmodium falciparum, P. vivax, P. ovale, P. malariae and P. knowlesi
- P. falciparum and P. vivax pose the greatest threat. in saudi arabia most commonly is falciparum. we should know the agent so we can treat based on the agent. Each one requires different antibiotic.

Transmitted

- through the bites of infected female Anopheles mosquitoes (vector).
- Other modes of transmission:
- From mother to unborn child. Technical transmission from mother to baby
- Blood transfusion

Plasmodium Parasites transmission and lifecycle:



2 life cycles
one inside the human body and the second inside the mosquito

- Mosquito takes parasite in gametocyte stage and it grows inside the mosquito and multiplies and grow till it reach sporozoite stage.
- Then sporozoite will be injected to the human body, it reach liver, it will be developed to merozoites
- merozoites from liver goes to RBCs, then multiplies, and gives you gametocytes which build ups until the RBCs ruptures, and spread in the body and gives you the cycle all over again.
- these cases result in hemolysis and in severe cases might cause severe anemia.

Clinical features:

Paroxysmal fever

- **Cold stage**: lassitude, headache, nausea, chills. (¼ -1 h) skin cold then hot
- **Hot stage:** skin hot and dry (2 -6 h)
- **Sweating stage**: fever subsides, sweating (2 -4 h)

Early Symptoms

Fever
Headache
Chills

If not treated early might progress to →

Severe illness

Severe anemia Respiratory distress Cerebral malaria

Multiorgan failure

we should diagnose, give treatment. if the patient didn't get proper treatment, he will develop severe illness, which might include cerebral malaria, respiratory failure, severe anemia with the hemolysis, and multiorgan failure.

Risk factors

- No or little immunity against the disease in areas with high transmission
- Young children, who have not yet developed partial immunity to malaria
- Pregnant women, whose immunity is decreased by pregnancy.
- Travelers or migrants coming from areas with little or no malaria transmission, who lack immunity.
- People with low immunity such as HIV patients
- Poverty
- Environmental: rain seasons

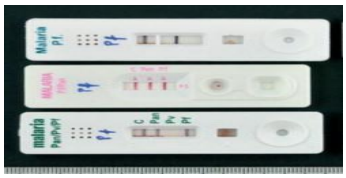
Immunity against malaria (protection)

- Genetic Factors: Biologic characteristics present from birth can protect against certain types of malaria: **(having the sickle cell trait)**
- Acquired Immunity: newborns in endemic areas will be protected during the first few months by maternal antibodies.
- Repeated attacks of malaria

➔ repeated attacks
➔ **sickle cells**
➔ Mother exposed before being pregnant have immunity and the baby receive the protection
➔ Trial of malaria vaccine

Diagnosis

- Microscopy: thin film, thick film
- Serology: two weeks after infection, past infection in epidemiological studies.
- Rapid diagnostic test (RDT):



Community Diagnosis

- Pre-eradication: spleen rate, parasite rate….
- Eradication: microscopic diagnosis
- Parasite incidence
- Blood examination rate
- Vector indices
- Human blood index
- Sporozoite rate
- Mosquito density
- Man biting rate
- Inoculation rate

parasite under microscope, RBCs + parasites inside the RBCs we can see it under the microscope,
1/ we do microscopy: slide or thick film,
-thin film have little amount of RBCs better quality to see the parasytes.
-thick film importance is that it is thicker so more amount of RBCs so it is more sensitive, if the parasite density is very little and i took film, i'll have more RBCs to check them so if the infection is in the beginning it will be more effective.
2/ second method is serology: antibodies from blood, antibodies develops after the infections, or it can indicate previous infection but it took time, it is more effective for epidemiology studies not for diagnosis.
3/ Rapid diagnostic test: surveys, screening programs, endemic area it is simple,

Treatment

Choice of treatment line depends on:

- Type of plasmodium species and stages of malaria parasites.
- Clinical status of patient: Uncomplicated or Severe, or pregnancy.
- Drug sensitivity of the infected parasite (area)
- Previous exposure to anti-malarial drugs.

Artemisinin combination therapy (ACT): (3days)

Monotherapy is not recommended for malaria treatment to prevent drug resistance.

For uncomplicated malaria:
First line: (ARTESUNATE + SP); alternative (ARTESUNATE + MEFLOQUINE)
Second Line: (ARTEMETHER + LUMEFANTRINE)
Third Line: (oral QUININE + DOXYCYCLINE)
A single dose of Primaquine is added to the first day as a gametocidal medication.

Primaquine is contraindicated in:

- G6PG deficiency
- pregnancy
- children < 6m
- lactating mothers for babies <6m or
- hypersensitivity

decrease risk of resistance :
we shouldn't start with one kind of treatment because it will increase the incedance of resistance, so we start with 2 or 3 medications

extra: single dose of primoquine for gametocyte. especially in falciparum
primaquine is contraindicated in case of pregnancy, children under six month of age, lactating mother, G6PD,

Treatment failure

- Failure to resolve or recurrence of fever or parasitemia:
- Early (1-3 days of treatment)
- Late: (4days – 6 weeks after treatment)
- Causes:
  1-Poor adherence to treatment 2-Low or incomplete dose
  3-Abnormal individual pharmacokinetics 4-Drug resistance

Antimalarial drug resistance

- The ability of the parasite to survive and/or multiply despite the administration and absorption of medication.
- **Reason:**
  - Exposure of the parasite to insufficient amount of the drug. pharmacokinetics: is different for the patient
    - Low dose prescribed
    - Lesser amount dispensed
    - Incomplete treatment
    - Vomiting. vomiting> no absorption of the drug
    - Low absorption

WHO efforts in malaria control:

Global Technical Strategy for Malaria 2016–2030

1.Ensure universal access to malaria prevention, diagnosis and treatment 2.Accelerate efforts towards elimination and attainment of malaria-free status 3.Transform malaria surveillance into a core intervention

Control of malaria: vector eradication is the primary way to prevent malaria

The main way to reduce malaria transmission at a community is **vector control** by apply the following:

1-Decrease human-mosquito contact: (primary prevention)

- Insecticide-treated mosquito nets (ITNs)
- For all at-risk persons
- Provision of free LLINs (long-lasting insecticidal net)
- Everyone sleeps under a LLIN every night.

mosquitoes mostly active at night
they dip it with insecticide then they cover the bed with the net

2-Destruction of adult mosquitoes: (primary)

- Indoor spraying with residual insecticides
- **At least 80%** of houses in targeted areas are sprayed
- Protection depends on type of insecticide.

3-Destruction of mosquito larvae: (primary) small mosquitoes

- Larviciding of water surfaces, intermittent irrigation, biological control

4-Environmental control (secondary)

- Environmental sanitation, water management, drainage

5-Source reduction (secondary)

- Environmental sanitation, water management, drainage

6-Chemoprophylaxis (secondary) (before exposure to prevent infection. Military for south border)

- To travelers , travelers to Malaria Endemic areas receive prophylactic chemotherapy Before , during and after traveling.
- Pregnant women
- Infants in endemic areas
- Seasonal chemoprevention

7-Vaccination (secondary)

- Still under trial

8-Social participation (secondary)

- Health education, community participation

Risk factors in Saudi Arabia:

- Heavy rainfall season
- Army personnel and employees working at the Southern borders
- Travelers to countries with active malaria transmission
- Pilgrimage from regions with active malaria transmission

Prevention and control of malaria in KSA:

The current elimination strategy in Saudi Arabia focuses mainly on:

1. Targeting high risk areas for sustained preventative measures such as (Long lasting insecticide treated nets, Indoor residual spraying)
2. Management of infection through rapid confirmed diagnosis and treatment.
3. Individual case follow up and reactive surveillance with appropriate treatment and vector control.
4. Active case detection at borders with screening and treatment.

Malaria and Hajj season:

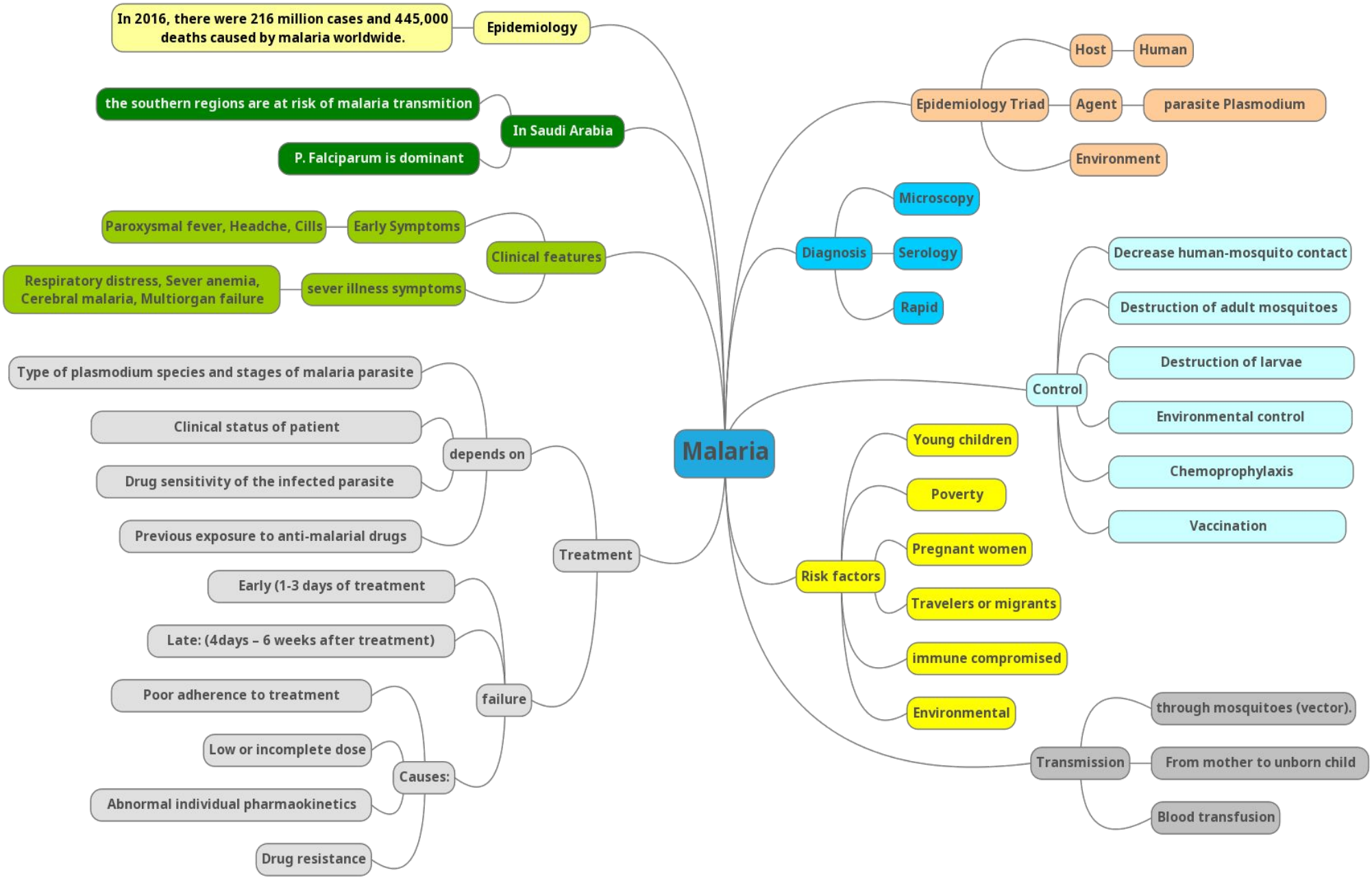
Measures applied before inlet of Pilgrims:

- Spray health care facilities pilgrims camps with residual insecticides.
- **Surveillance at Hajj Entry ports** (suspected cases/ necessary measures).

Measures applied during Hajj season:

- Epidemiology investigation malaria cases (proper diagnosis/treatment).
- Secure malaria drugs and treatment policy for all health care facilities.

Summary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Paroxysmal fever, Headche, Cills
sever illness symptoms
Respiratory distress, Sever anemia, Cerebral malaria, Multiorgan failure
Treatment
depends on
Type of plasmodium species and stages of malaria parasite
Clinical status of patient
Drug sensitivity of the infected parasite
Previous exposure to anti-malarial drugs
failure
Early (1-3 days of treatment
Late: (4days – 6 weeks after treatment)
Causes:
Poor adherence to treatment
Low or incomplete dose
Abnormal individual pharmaokinetics
Drug resistance
Epidemiology Triad
Host
Human
Agent
parasite Plasmodium
Environment
Diagnosis
Microscopy
Serology
Rapid
Control
Decrease human-mosquito contact
Destruction of adult mosquitoes
Destruction of larvae
Environmental control
Chemoprophylaxis
Vaccination
Risk factors
Young children
Poverty
Pregnant women
Travelers or migrants
immune compromised
Environmental
Transmission
through mosquitoes (vector).
From mother to unborn child
Blood transfusion

Community Medicine

THE END

436 TEAMS