



## OVERVIEW OF MALARIA PARASITE AND ITS PREVENTION IN INDIA

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### ABSTRACT:

**Background:** Malaria is a systematic disease caused by a parasite called Plasmodium which is transmitted into the human blood via female Anopheles mosquito. Malaria in humans is caused by four species of protozoan parasites of the genus *Plasmodium*: *P. falciparum*, *P. vivax*, *P. ovale*, and *P. malariae*. The parasite enters the human body through a mosquito bite and travel to the very crucial organ, the liver, where they multiply and come back to the bloodstream and destroy red blood cells. Malaria causes symptoms that typically include fever, tiredness, vomiting, and headaches. In severe cases it can cause yellow skin, seizures, coma, or death. Symptoms usually begin ten to fifteen days after being bitten by an infected mosquito. In those who have recently survived an infection, reinfection usually causes milder symptoms.

**Objectives:** Isolation of different species of malaria parasites. The prevalence of malaria parasite in India.

**Methods:** The procedure follows these steps: collection of peripheral blood, staining of smear with Leishman's stain and examination of red blood cells for malaria parasites under the microscope.

**Results:** We observed the plasmodium species in peripheral blood smear.

**Conclusion:** Worldwide, the number of cases of malaria caused by *Plasmodium falciparum*, the most dangerous species of the parasite, is on the rise.

### HISTORY

Our understanding of the malaria parasites begins in 1880 with the discovery of the parasites in the blood of malaria patients by Alphonse Laveran. India's expansive geography and diverse climate supports ideal environments for sustaining malaria parasites

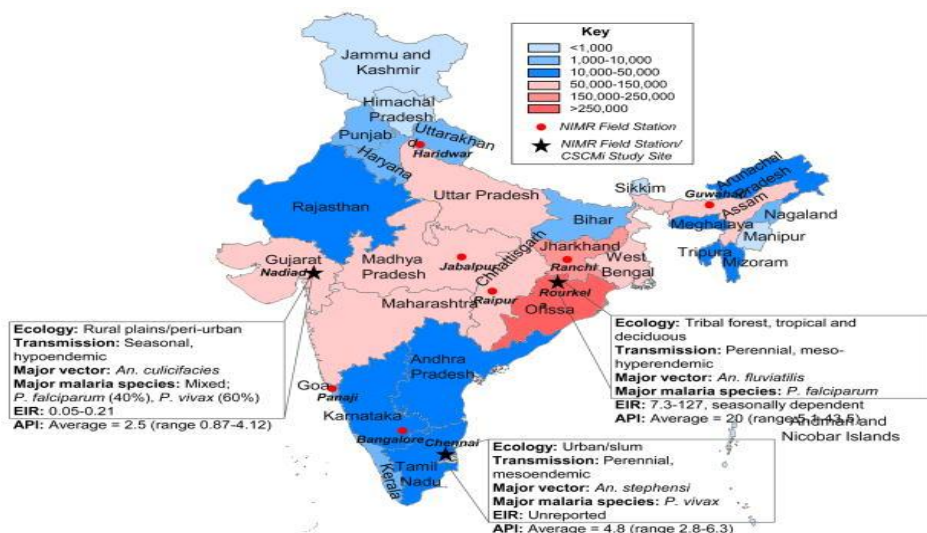
and their vectors. The two major human malaria species in India are *Plasmodium falciparum* and *P. vivax*; *P. malariae* has been in the eastern India state of Orissa,<sup>1</sup> while *P. ovale* appears to be extremely rare if not absent reported. Intriguingly, the two major infecting species vary in proportion across India. For example, the southern state of Tamil

Nadu suffers from *P. vivax*, *P. falciparum* is the dominant parasite in Orissa, and mixed-species infections are prevalent in the west (e.g., Gujarat state) <sup>2</sup>. As the second most populous country in the world, with a population exceeding one billion people, India's public health system faces many challenges including implementation of surveillance programs to accurately estimate and control the national malaria burden. Historically, the highest incidence of malaria in India occurred in the 1950s, with an estimated 75 million cases and 0.8 million deaths per year (World Health Organization, Country Office for India). The launch of the National Malaria Control Program (NMCP) in 1953 resulted in a significant decline in the number of reported cases to <50,000 and no reported mortality, by 1961. Despite its near elimination in the mid-1960's, malaria resurged to ~6.45 million cases in 1976. Since then, confirmed cases have gradually decreased to 1.6 million cases and ~1,100 deaths in 2009. Recently, it has been suggested that the malaria incidence is between 9 to 50 times greater than reported (reviewed in Hay *et al.*, 2010), with a ~13-fold underestimation of malaria-related mortality (Dhingra *et al.*, 2010). Such claims reinforce the need for robust and comprehensive epidemiological surveillance studies across the country (Singh *et al.*, 2009) to determine the actual burden.

## INTRODUCTION

Malaria is a mosquito-borne infectious disease affecting humans and other animals caused by single-celled microorganisms belonging to the Plasmodium group. The mosquito bite introduces the parasites from the mosquito's saliva into a person's blood.

The parasites travel to the liver where they mature and reproduce. There are more than 100 species of *Plasmodium*, which can infect many animal species such as reptiles, birds, and various mammals. Four species of *Plasmodium* have long been recognized to infect humans in nature. The genus *Plasmodium* is classified into two subgenera: *P. vivax*, *P. malariae* and *P. ovale* belong to the subgenus *Plasmodium* while *P. falciparum* belongs to the subgenus *Laverania* because it differs in a number of aspects from the other three species. *P. vivax*, *P. malariae* and *P. ovale* are closely related to other primate malaria parasites. *P. falciparum* is more related to bird malaria parasites and appears to be a recent parasite of humans, in evolutionary terms. Perhaps for this reason, *falciparum* infection causes the most severe form of malaria and is responsible for nearly all fatal cases. *P. knowlesi*, a parasite of long-tailed Macaque monkeys may also affect man<sup>3</sup>



## MATERIAL AND METHODS:

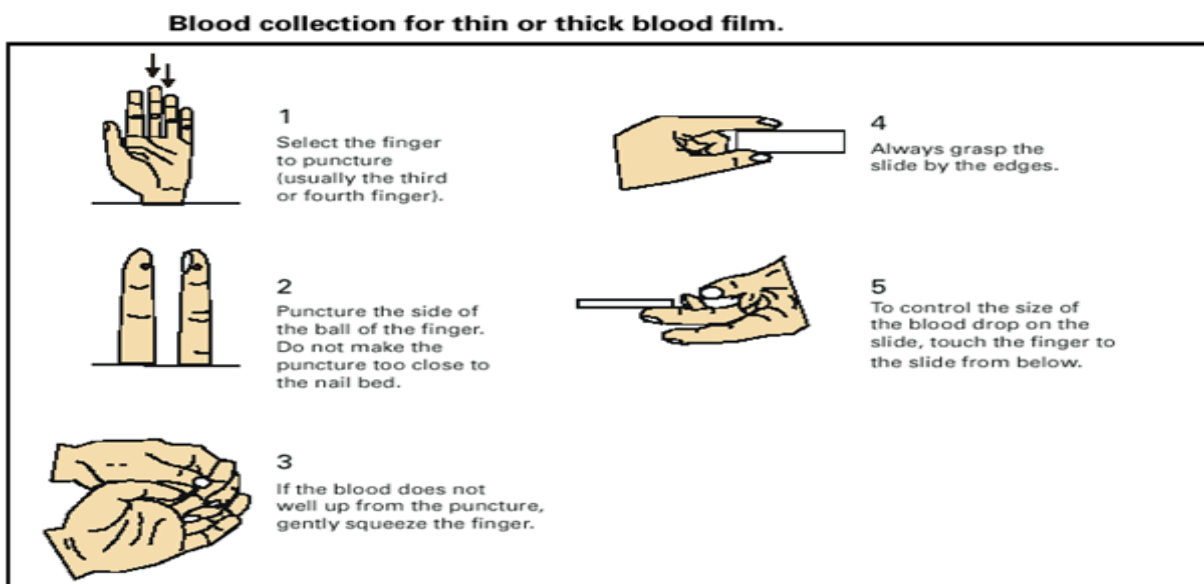
**Preparation of the smear:** Use universal precautions while preparing the smears for malarial parasites – use gloves; use only disposable needles/lancets; wash hands; handle and dispose the sharp instruments and other materials contaminated with blood carefully to avoid injury.

- Hold the third finger of the left hand and wipe its tip with spirit/Savlon swab; allow to dry Prick the finger with disposable

needle/lancet; allow the blood to ooze out.

- Take a clean glass slide.
- Take 3 drops of Blood 1 cm from the edge of the slide take another drop of blood one cm from the first drop of blood.
- Take another clean slide with smooth edges and use it as a spreader and make thick and thin smears.

Allow it to dry Slide number can be marked on the thin smear with a lead pencil.



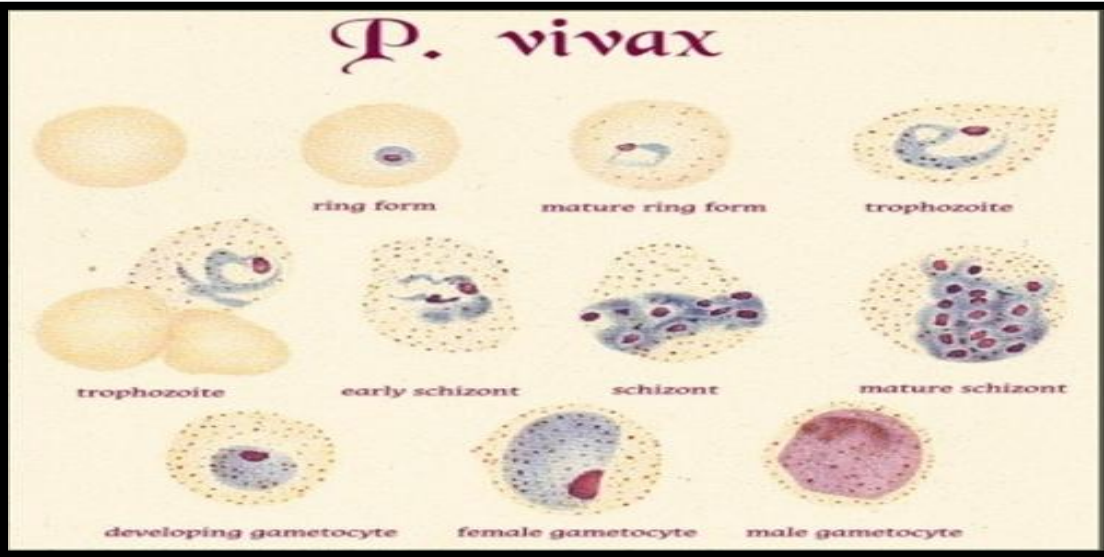
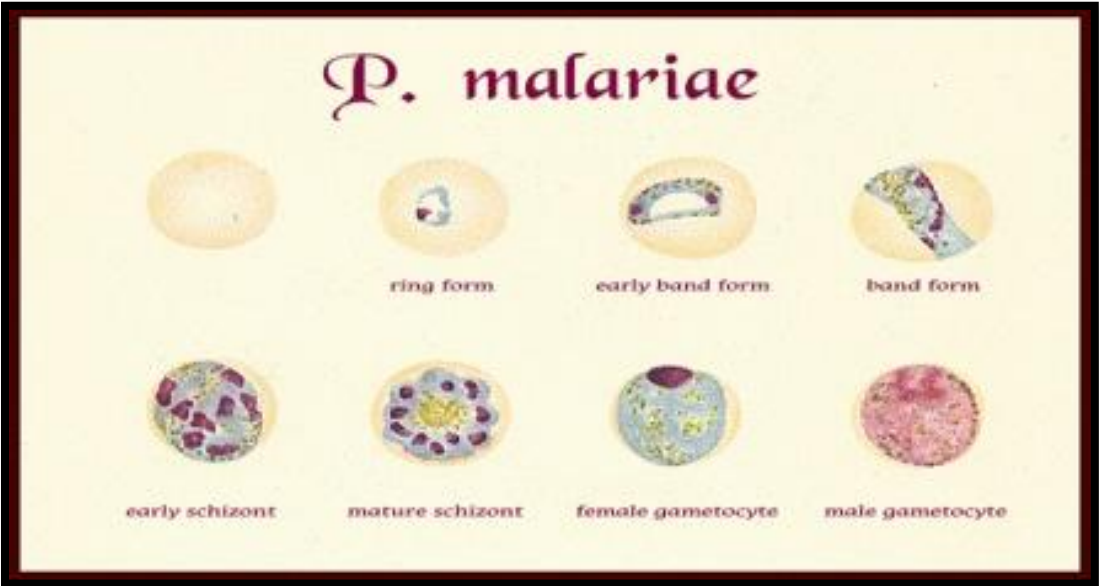
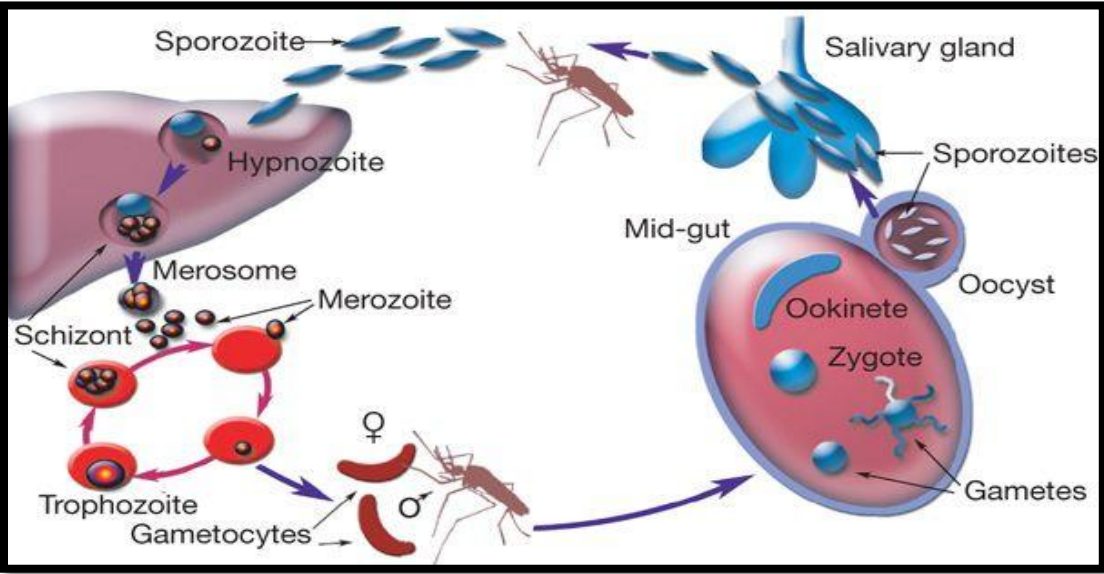
### **Leishman's stain:**

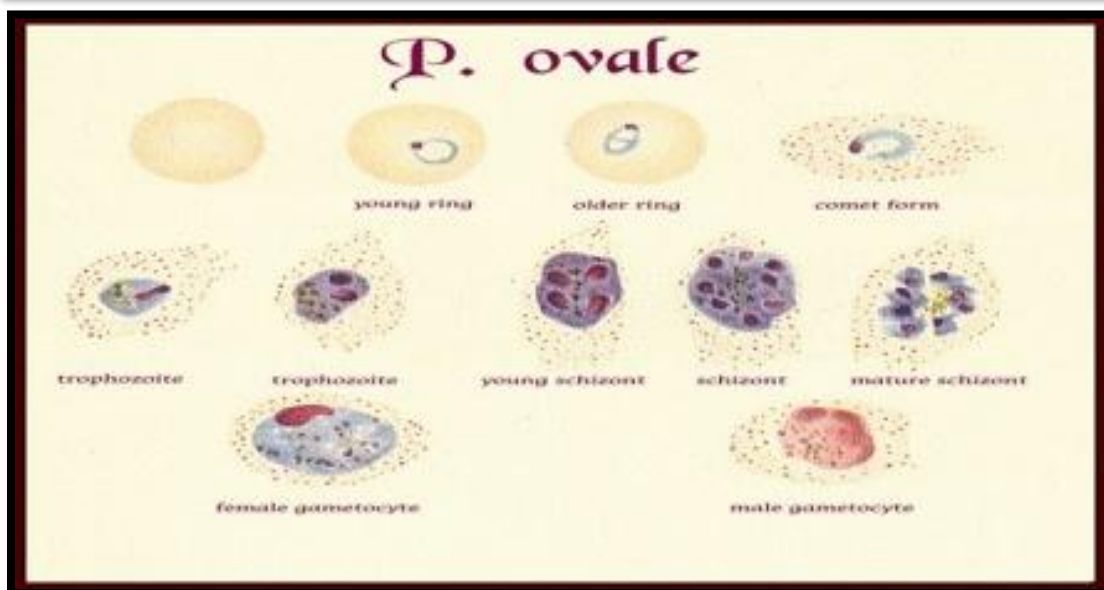
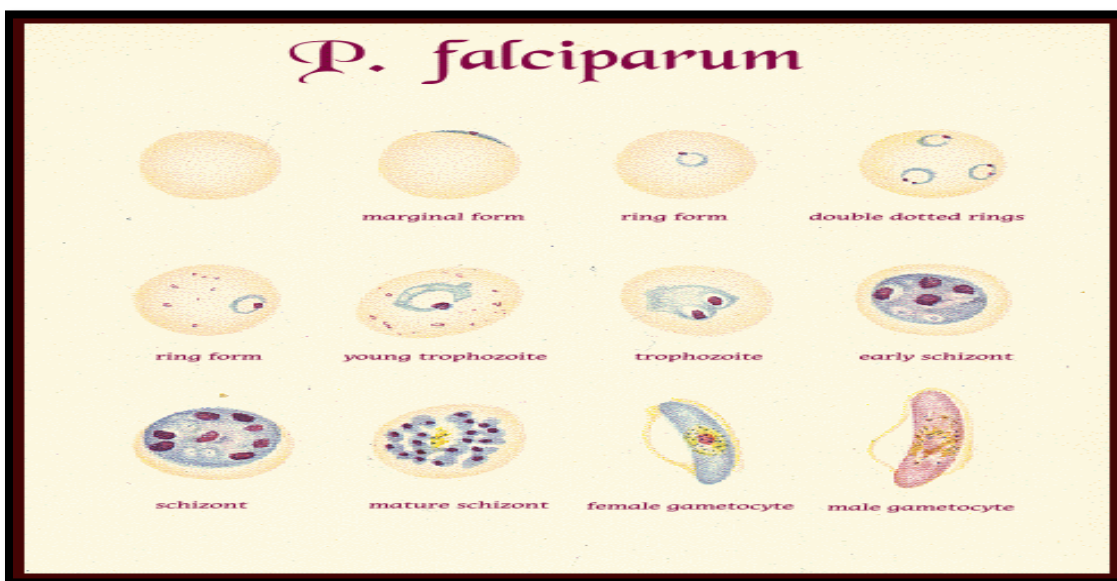
- Add 7-8 drops of the stain and leave for 1-2 minutes.
- Then add 12-15 drops of buffered distilled water, mix thoroughly, leave for 4 – 8 minutes.
- Then wash off with clean water, drain, dry and examine.

### **LIFE CYCLE OF MALARIA PARASITE**

The malaria parasite has a complex, multistage life cycle occurring within two living beings, the vector mosquitoes and the vertebrate hosts. The survival and development of the parasite within the invertebrate and vertebrate hosts, in intracellular and extracellular environments, is made possible by a toolkit of more than 5,000 genes and their specialized proteins that help the parasite to invade and grow within

multiple cell types and to evade host immune responses.[2,3] The parasite passes through several stages of development such as the sporozoites (Gr. *Sporos* = seeds; the infectious form injected by the mosquito), merozoites (Gr. *Meros* = piece; the stage invading the erythrocytes), trophozoites (Gr. *Trophes* = nourishment; the form multiplying in erythrocytes), and gametocytes (sexual stages) and all these stages have their own unique shapes and structures and protein complements. The surface proteins and metabolic pathways keep changing during these different stages, that help the parasite to evade the immune clearance, while also creating problems for the development of drugs and vaccines.[3]





## PREVENTION

Malaria is a preventable and treatable disease. Interventions to prevent malaria include: Vector control: sleeping under insecticide-treated nets (ITNs), indoor residual spraying (IRS) and in some specific settings, larval control. Intermittent preventive treatment for pregnant women and infants and seasonal chemoprophylaxis for children 1-5 years of age. Diagnosis and treatment of malaria. **Awareness of risk** – find out whether you're at risk of getting malaria. **Bite prevention** – avoid mosquito bites by using insect repellent, covering your arms and legs, and using a

mosquito net. **Check whether you need to take malaria prevention tablets** – if you do, make sure you take the right antimalarial tablets at the right dose, and finish the course. **Diagnosis** – seek immediate medical advice if you have malaria symptoms, including up to a year after you return from travelling. To avoid being bitten: Stay somewhere that has effective air conditioning and screening on doors and windows. If this isn't possible, make sure doors and windows close properly. If you're not sleeping in an air-conditioned room, sleep under an intact mosquito net that's been treated with insecticide. Use insect repellent on your skin and in sleeping environments.

Remember to reapply it frequently. The most effective repellents contain diethyltoluamide (DEET) and are available in sprays, roll-ons, sticks and creams. Wear light, loose-fitting trousers rather than shorts, and wear shirts with long sleeves. This is particularly important during early evening and at night, when mosquitoes prefer to feed. When taking antimalarial medication: make sure you get the right antimalarial tablets before you go – check with your GP or pharmacist if you're unsure follow the instructions included with your tablets carefully depending on the type you're taking, continue to take your tablets for up to 4 weeks after returning from your trip to cover the incubation period of the disease

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