
Malaria

Frequently Asked Questions

1. What is malaria?

Malaria is a potentially life-threatening disease caused by blood parasites of the genus *Plasmodium*, which are transmitted via the bites of infected mosquitoes. In the human body, the parasites first multiply in the liver, and then infect the red blood cells.

Malaria is preventable and curable. Increased malaria prevention and control measures are dramatically reducing the malaria burden. Globally, malaria is one of the six major causes of deaths from communicable diseases. 90% of world's approximately 600 000 annual malaria deaths occur in Africa. In the last few years (2015-2018) South Africa has had between about 10 000 and 30 000 notified cases of malaria per year, and the National Department of Health is planning to eradicate it (i.e. no local transmission) by 2023. However, there are increasing problems with importation of malaria cases, vector control spraying programme delivery, vector insecticide resistance, and many health provision challenges that stand in the way of this objective.

2. Who can get malaria?

Approximately half of the world's population is at risk of malaria.

Specific population risk groups include:

- young children living in malaria areas who have not yet developed protective immunity against the most severe forms of the disease;
- pregnant women, as malaria causes high rates of miscarriage and can lead to maternal death;
- people with HIV/AIDS;
- international travellers from non-endemic areas because they lack immunity;
- immigrants from endemic areas and their children living in non-endemic areas and returning to their home countries to visit friends and relatives are similarly at risk because of waning or absent immunity.

3. Where does malaria occur in and around South Africa?

Malaria occurs mainly in tropical developing countries in sub-Saharan Africa, Central and South America, Asia and Oceania. Through effective malaria control measures, malaria transmission has been limited to the north-eastern part of South Africa, mainly in the low altitude (below 1000 m) areas of Limpopo, Mpumalanga and northern KwaZulu-Natal provinces. Limited focal transmission may occasionally occur in the North West and Northern Cape provinces along the Molopo and Orange rivers. Malaria is distinctly seasonal in South Africa, with the highest risk being during the wet summer months (September to May).

All of South Africa's neighbouring countries, with the exception of Lesotho, have malaria transmission. Most imported malaria in South Africa is acquired in Mozambique, because of its high prevalence there and the large cross-border movement of people. Swaziland, Botswana, Namibia and Zimbabwe have more limited risk areas for malaria transmission.

4. How is malaria transmitted?

Malaria is caused by protozoan parasites of the genus *Plasmodium* that are transmitted to humans by certain species of the *Anopheles* mosquito. There are 4 main species (the 5th, *Plasmodium knowlesi*, is a monkey malaria that is restricted to a few areas in Southeast Asia and affects small numbers of people):

Parasite species	Modern disease name	Historic disease names
<i>Plasmodium falciparum</i>	falciparum malaria	Malignant tertian, pernicious malaria
<i>Plasmodium vivax</i>	vivax malaria	benign tertian, simple tertian malaria
<i>Plasmodium ovale</i>	ovale malaria	ovale tertian malaria
<i>Plasmodium malariae</i>	quartan or malariae malaria	quartan malaria

5. Does malaria affect animals?

Some animals, e.g. birds, rodents, reptiles, can be infected with malaria species that are different from the human ones mentioned above. Apes and humans can share some malaria species (e.g. *P. knowlesi*), but otherwise animal malaria does not normally affect humans.

6. What are the signs and symptoms of malaria?

- The incubation period of malaria may be as short as 7 days after exposure but is on average 10 to 21 days in patients who are non-immune and have not taken chemoprophylaxis.
- Incubation periods may be prolonged in patients who have taken prophylaxis or have taken certain antibiotics for other reasons.
- The first symptoms of malaria are non-specific and acute in onset. Fever and influenza-like symptoms are particularly common presenting symptoms of malaria and influenza is the most common misdiagnosis of malaria.
- In adults, headache, rigors with cold shivers and sweating, and myalgia, are common. Some of the following may also occur: weakness, fatigue, abdominal discomfort, diarrhoea, loss of appetite, nausea and vomiting, sore throat, and cough.
- In young children, rigors, headache is less common and malaria may present with fever and any of the following: lethargy, poor feeding, vomiting, diarrhoea or cough.
- Presentation of falciparum malaria is very variable and may mimic many other diseases including influenza, viral hepatitis, meningitis, septicaemia, typhoid, tick bite fever, gastroenteritis, viral haemorrhagic fever, trypanosomiasis, HIV seroconversion illness, urinary tract infection and relapsing fever.
- In a febrile patient in South Africa where there is no other obvious cause of fever and there is no recent history of visiting or living in a malaria area, malaria should still be considered as infected mosquitoes can travel long distances by road, rail and air transport and transmit the infection (this is called 'odyssean malaria'). This is particularly important in large urban areas with extensive migrant worker populations.
- The first symptoms of malaria (see above) may be mild and difficult to recognize as malaria. If not treated within 24-48 hours, *P. falciparum* malaria can progress to severe illness, often leading to death. Children with severe malaria frequently develop one or more of the following complications: severe anaemia, respiratory distress, metabolic acidosis, hypoglycaemia, or cerebral malaria with coma and/or convulsions. In adults, multi-organ involvement, including lung, kidney and liver dysfunction, is also frequent. Pregnant patients are more likely to develop severe and complicated malaria.

7. How is malaria diagnosed?

The most important element in the diagnosis of malaria is to have a high index of suspicion, so the diagnosis can be made as soon as possible. The diagnosis of malaria should be immediately considered in any patient with fever who has travelled to, or lives in, a malaria area, even if chemoprophylaxis has been taken. The majority of deaths and cases of complicated malaria result from delayed diagnosis and/or inappropriate treatment. Confirmation of malaria is made by the examination of blood for parasites, either by blood smear or a rapid malaria test. A negative blood test or rapid malaria test does not exclude the presence of malaria; repeat tests should be made until a diagnosis is confirmed or symptoms resolve. In patients with severe illness in whom the diagnosis cannot be immediately confirmed, treatment for malaria should be given after a malaria smear is made.

8. How is malaria treated?

- The objectives of malaria treatment are to cure the infection, prevent progression to severe disease, prevent morbidity and mortality, to reduce transmission of infection to others, and to limit the emergence and spread of drug resistance.
- Highly effective oral treatment is available for early, uncomplicated malaria. More seriously ill patients require hospital admission for intravenous antimalarial drugs.
- The choice of chemotherapy for malaria is dependent on the severity of disease, the known or suspected resistance pattern of the parasite in the area where the malaria infection was acquired, the species of parasite, patient characteristics (age, pregnancy, co-morbidity, allergies, other medications) and the presence or absence of vomiting.
- Drug choices may change over time depending on future development of parasite resistance and availability of other anti-malarial treatment.
- It is critically important to differentiate between uncomplicated and severe malaria. It is easy to underestimate severity of illness and better to err on the side of caution and over-treat rather than under-treat.
- Uncomplicated malaria is defined as symptomatic malaria without signs of severity or evidence of vital organ dysfunction. Typically a patient with uncomplicated malaria has mild symptoms, is ambulant and has no evidence of organ dysfunction, either clinically or on laboratory testing.
- Uncomplicated malaria may rapidly progress to severe malaria if the patient is not treated appropriately and promptly with effective drugs.
- The presence of jaundice, any change in mental status and an increased respiratory rate would place the patient in the category of complicated malaria.
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9. How can malaria be prevented?

Malaria is a life-threatening disease that is a major health risk for travellers to malaria endemic areas. Appropriate advice and use of drug and, most importantly, non-drug prophylactic measures can prevent most travellers from contracting the disease.

Mosquito avoidance

Since no anti-malarial drug used for prophylaxis is 100% effective and compliance may be an issue, special emphasis should always be placed on the importance of preventing contact with mosquitoes. These measures have the advantage that they are less toxic than drugs. Malaria vector mosquitoes feed between dusk and dawn, both indoors and outdoors. Mosquito contact can be significantly reduced by using personal protection measures, as follows:

- Remain indoors between dusk and dawn.

- Wear long-sleeved clothing, preferably light coloured. Since mosquitoes tend to bite below the waist and especially below the knees, the wearing of long trousers and socks is recommended.
- Mosquito repellents applied to the exposed skin are highly effective. The most effective compounds are those containing DEET (N,N-diethyl-3-methylbenzamide). The optimal concentration is about 30% for adults. These should be applied sparingly to exposed skin surfaces and ideally repeated after 4-6 hours and after showering or bathing. Repellents should not be applied to the face or lips or eyelids and the dosage should not be exceeded, especially for small children. DEET-containing compounds should not be used in children under 3 months. NB Use repellents strictly according to manufacturers' instructions.
- Mosquito repellents that do not contain DEET may be much less effective, are shorter acting, and require very frequent application.
- Knock-down insecticidal sprays, vaporization mats and mosquito coils are also highly effective and may temporarily eliminate mosquitoes that have gained entry to a dwelling. Spray inside the dwelling with an aerosol insecticide (for flying insects) at dusk, especially the bedrooms, after closing the windows.
- Use anti-mosquito gauze on windows and doors, particularly for residents of malaria areas.
- Ceiling fans and air conditioners are also effective in disturbing mosquito feeding.
- Bednets are useful in preventing mosquito bites. Those that have been impregnated with insecticide are significantly more effective and can also repel or kill mosquitoes, further reducing malaria risk. Nets should not be damaged and must be tucked in under the mattress. Baby cots and prams may be covered with mosquito netting for protection against mosquitoes.

Chemoprophylaxis

Before entering an endemic malaria area, the relative need for chemoprophylaxis in addition to personal protection measures against mosquito bites, needs to be determined. It is important to note that no prophylactic regimen is 100% effective.

Sensible use of malaria chemoprophylaxis is a balance between the risk of infection and death and the risk of the adverse reactions to the chemoprophylactic drug, and several factors therefore need to be taken into consideration when making a decision regarding chemoprophylaxis:

- The risk of contracting malaria – this includes the area and type of accommodation, when the person will be in the area and for how long he or she will be there.
- Personal factors such as age, current medication and concomitant illness.
- Medication options, their availability, adverse effects and resistance.

Advice from a medical practitioner with travel medicine experience should be sought well in advance of travel. Other travel-related advice such as immunisations should be obtained at the same time.

10. Where can I find out more information?

- NICD website (www.nicd.ac.za): Diseases A-Z, click on M for malaria
- General information: www.malaria.org.za, www.who.int/topics/malaria/en/
- For healthcare workers: Contact the NICD hotline after hours and in emergency situations