World Health Organization

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Malaria

Infection and transmission

Malaria is a disease which can be transmitted to people of all ages. It is caused by parasites of the species *Plasmodium* that are spread from person to person through the bites of infected mosquitoes. The common first symptoms – fever, headache, chills, and vomiting – appear 10 to 15 days after a person is infected. If not treated promptly with effective medicines, malaria can cause severe illness that is often fatal.

There are four types of human malaria – *Plasmodium falciparum, P.vivax, P.malariae,* and *P.ovale. P.falciparum* and *P.vivax* are the most common. *P.falciparum* is by far the most deadly type of malaria infection.

Malaria transmission differs in intensity and regularity depending on local factors such as rainfall patterns, proximity of mosquito breeding sites and mosquito species. Some regions have a fairly constant number of cases throughout the year – these are *malaria endemic* – whereas in other areas there are "malaria" seasons, usually coinciding with the rainy season.

Large and devastating epidemics can occur in areas where people have had little contact with the malaria parasite, and therefore have little or no immunity. These epidemics can be triggered by weather conditions and further aggravated by complex emergencies or natural disasters.

Global and regional risk

Approximately, 40% of the world's population, mostly those living in the world's poorest countries, are at risk of malaria. Every year, more than 500 million people become severely ill with malaria. Most cases and deaths are in sub-Saharan Africa. However, Asia, Latin America, the Middle East and parts of Europe are also affected. Travellers from malaria-free regions going to areas where there is malaria transmission are highly vulnerable – they have little or no immunity and are often exposed to delayed or wrong malaria diagnosis when returning to their home country.

Treatment

Early diagnosis and prompt treatment are the basic elements of malaria control. Early and effective treatment of malaria disease will shorten its duration and prevent the development of complications and the great majority of deaths from malaria. Access to disease management should be seen not only as a component of malaria control but a fundamental right of all populations at risk. Malaria control must be an essential part of health care development. In contemporary control, treatment is provided to cure patients rather than to reduce parasite reservoirs.

Antimalarial treatment policies will vary between countries depending on the epidemiology of the disease, transmission, patterns of drug resistance and political and economic contexts.

Drug resistance

The rapid spread of antimalarial drug resistance over the past few decades has required more intensive monitoring of drug resistance to ensure proper management of clinical cases and early detection of changing patterns of resistance so that national malaria treatment policies can be revised where necessary. Surveillance of therapeutic efficacy over time is an essential component of malaria control. Recent efforts to scale-up malaria control in endemic countries throughout the world including increased support for commodities and health systems, as well as the proposed price subsidy on artemisinin-based combination therapies (ACTs) is resulting in greater access to and a vastly increased use of antimalarial medicines, in particular ACTs. This is leading to a much higher degree of drug pressure on the parasite which will almost certainly increase the likelihood of selecting for resistant parasite genotypes. There are currently no effective alternatives to artemisinins for the treatment of *P. falciparum* malaria either on the market or towards the end of the development pipeline.

The parasite's resistance to medicines continues to undermine malaria control efforts. WHO has therefore called for continuous monitoring of the efficacy of recently implemented ACTs, and countries are being assisted in strengthening their drug resistance surveillance systems. In order to preserve the efficacy of artemisinins as an essential component of life-saving ACTs, WHO has called for a ban on the use of oral artemisinin monotherapies, at various levels, including manufacturers, international drug suppliers, national health authorities and international aid and funding agencies involved in the funding of essential antimalarial medicines.

Prevention: vector control and intermittent preventive therapy in pregnant women

The main objective of malaria vector control is to significantly reduce both the number and rate of parasite infection and clinical malaria by controlling the malaria-bearing mosquito and thereby reducing and/or interrupting transmission. There are two main operational interventions for malaria vector control currently available: Indoor Residual Spraying of long-acting insecticide (IRS) and Long-Lasting Insecticidal Nets (LLINs). These core interventions can be locally complemented by other methods (e.g. larval control or environmental management) in the context of Integrated Vector Management (IVM). Effective and sustained implementation of malaria vector control interventions (IRS or LLINs) requires clear political commitment and engagement from national authorities as well as long-term support from funding partners.

Pregnant women are at high risk of malaria. Non-immune pregnant women risk both acute and severe clinical disease, resulting in up to 60% fetal loss and over 10% maternal deaths, including 50% mortality for severe disease. Semi-immune pregnant women with malaria infection risk severe anaemia and impaired fetal growth, even if they show no signs of acute clinical disease. An estimated 10 000 of these women and 200 000 of their infants die annually as a result of malaria infection during pregnancy. HIV-infected pregnant women are at increased risk. WHO recommends that all endemic countries provide a package of interventions for prevention and management of malaria in pregnancy, consisting of (1) diagnosis and treatment for all episodes of clinical disease and anaemia and (2) insecticide-treated nets for night-time prevention of mosquito bites and infection. In highly endemic falciparum malaria areas, this should be complemented by (3) intermittent preventive treatment with sulfadoxine–pyrimethamine (IPT/SP) to clear the placenta periodically of parasites.

Insecticide resistance

In spite of increased national and international efforts to scale up cost-effective malaria vector control interventions and maximize the protection of populations at risk, significant challenges continue to threaten these objectives and the sustainability of achievements. Challenges include increasing resistance of vector mosquitoes to insecticides, the behaviour and ecology of local malaria vectors – which often change as a result of vector control interventions -- and the diminishing number of available insecticides that can be used against malaria vectors (adulticides).

There are currently no alternatives to DDT and pyrethroids and the development of new insecticides will be an expensive long-term endeavour. Therefore, immediate sound vector resistance management practices are required to assure the continued utility of the currently available insecticides. At present there is only limited evidence of the impact of various resistance mechanisms on the efficacy of vector control interventions, whether they are implemented singly or in combination.

Recent evidence from Africa indicates that pyrethroid and DDT resistance is more widespread than anticipated. It is believed that the same level of resistance will have a more detrimental impact on the efficacy of IRS than on that of LLINs, but evidence for this is very limited. Networks for vector resistance monitoring still need greater strengthening in order to make resistance detection a routine operational feature of national programmes, particularly in countries in Africa and the Eastern Mediterranean region. Regional level databases feeding into a global database accessible by governments, scientists and policy-makers would greatly assist in the rational use and deployment of vector control interventions.

Socioeconomic impact

Malaria causes an average loss of 1.3% annual economic growth in countries with intense transmission. When compounded over the years, this loss has lead to substantial differences in GDP between countries with and without malaria. Malaria traps families and communities in a downward spiral of poverty, disproportionately affecting marginalized populations and poor people who cannot afford treatment or who have limited access to health care. Malaria's direct costs include a combination of personal and public expenditures on both prevention and treatment of disease. In some countries with a very heavy malaria burden, the disease may account for as much as 40% of public health expenditure, 30-50% of inpatient admissions and up to 60% of outpatient visits. Malaria has lifelong effects through increased poverty, impaired learning and decreases attendance in schools and the workplace.

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