Malaria

1. Introduction

1.1 Background

Malaria is a life-threatening parasitic disease transmitted by mosquitoes. It was once thought that the disease came from fetid marshes, hence the name malaria, (bad air). [1; 2; 3].

In 1880, scientists discovered the real cause of malaria; a one-cell parasite called *Plasmodium*. Later they discovered that the parasite is transmitted from person to person through the bite of a female *Anopheles* mosquito, which requires blood to nurture her eggs.

Today approximately 40% of the world's population; mostly those living in the world's poorest countries are at risk of malaria. The disease was once more widespread but it was successfully eliminated from many countries with temperate climates during the mid 20th century.

It is found throughout the tropical and sub-tropical regions of the world and causes more than 300 million acute illnesses and at least one million deaths annually [1; 2; 3].

1.2 Malaria - the disease

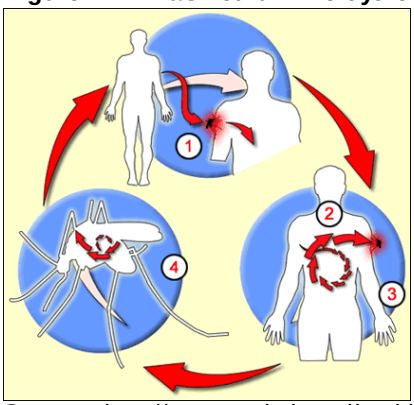
1.2.1 Parasite species

There are four types of human malaria *Plasmodium (P); P. malariae, P. ovale, P. vivax* and *P. falciparum. P. vivax* and *P. falciparum* are the most common and the latter being the most deadly type of malaria infection [1; 4].

1.2.2 Malaria parasite life cycle

The malaria parasite enters the human host when an infected *Anopheles* mosquito takes a blood meal. Inside the human host, the parasite undergoes a series of changes and allows plasmodia to invade the immune system, infect the liver and red blood cells, and finally develop into a form that is able to infect a mosquito again when it bites an infected person (figure 1.1) [4].

Figure 1.1: Plasmodium life cycle



Source: http://www.malariaandhealth.com

1.3 Clinical presentation and diagnosis

1.3.1 Symptoms and signs

Malaria symptoms appear about 9 to 14 days after the infectious mosquito bite, although this varies with different *Plasmodium* species. Typically, malaria produces fever, headache, vomiting and other flu-like symptoms.

Malaria can kill by infecting and destroying red blood cells (anaemia) and by clogging the capillaries that carry blood to the brain (cerebral malaria) or other vital organs [1; 2; 5].

1.3.2 Laboratory diagnosis

A diagnosis is usually made by examining a sample of the patient's blood under a microscope to detect parasites in red blood cells using Romanowsky (Giemsa's) stain or more recently by the ***Rapid Diagnostic Kit*** [5; 6; 7].

1.4 Distribution of malaria

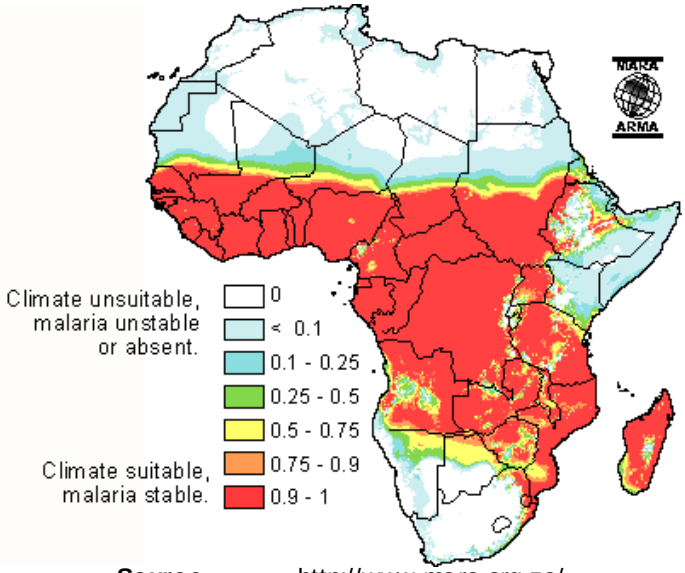
Malaria occurs mainly in tropical developing countries in Central and South America, Africa, Asia and Oceania [4; 5; 6].

1.4.1 Malaria in Africa

There are at least 300 million acute cases of malaria each year globally, resulting in more than a million deaths. Around 90% of these deaths occur in Africa, mostly in young children (fig. 1.2).

Malaria is Africa's leading cause of under-five mortality (20%) and constitutes 10% of the continent's overall disease burden.

Figure 1.2: Malaria distribution in Africa



Source: http://www.mara.org.za/

Most malaria infections in Africa south of the Sahara are caused by *Plasmodium falciparum,* the most severe and life threatening form of the disease. Many countries in Africa lack the infrastructure and resources necessary to mount sustainable campaigns against malaria and as a result few benefited from historical efforts to eradicate malaria [4; 5; 6].

During the period January to December 2003, 25 countries reported to WHO/AFRO a cumulative total of 22,018,052 outpatient cases, 310,920 in-patients and 36,737 deaths (Table 1.1), Annex 1.1.

1.4.2 Malaria in pregnancy

Malarial infection during pregnancy is a major public health problem in tropical and subtropical regions throughout the world. In most endemic areas of the world, pregnant women are the main adult risk group for malaria.

The symptoms and complications of malaria during pregnancy differ with the intensity of malaria

transmission and thus with the level of immunity the pregnant woman has acquired. In endemic areas, malaria infection of pregnant women results in a range of adverse pregnancy outcomes, including spontaneous abortion, neonatal death, low birth weight and also the death of the mother.

The promising news is that during the past decade potentially more effective strategies for the prevention and control of malaria in pregnancy have been developed and demonstrated to have a remarkable impact on improving the health of mothers and infants [8].

1.4.3 Malaria in children

Malaria accounts for one in five of all childhood deaths in Africa. Anaemia, epilepsy, neurological problems and low birth-weight - all are frequent consequences of malaria and compromise the health and development of millions of children throughout the tropical world.

Recent scientific advances now make it possible to dramatically reduce this burden. It will require an enormous financial, technical, and political commitment to reduce the number of childhood malaria deaths in Africa from the current level of one every 30 seconds. There is currently an unprecedented political momentum to carry this challenge forward. It will be well worth the effort [1; 5].

1.4.4 The burden of malaria in Africa

In Africa today, malaria is understood to be both a disease of poverty and a cause of poverty. Annual economic growth in countries with high malaria transmission has historically been lower than in countries without malaria. Economists believe that malaria is responsible for a growth penalty of up to 1.3% per year in some African countries.

Malaria also has a direct impact on Africa's human resources. Not only does malaria result in loss of life and lost productivity due to illness and premature death, but malaria also hampers children's schooling and social development through both absenteeism and permanent neurological and other damage associated with severe episodes of the disease [8; 9].

1.5 Malaria in South Africa

1.5.1 Historical situation

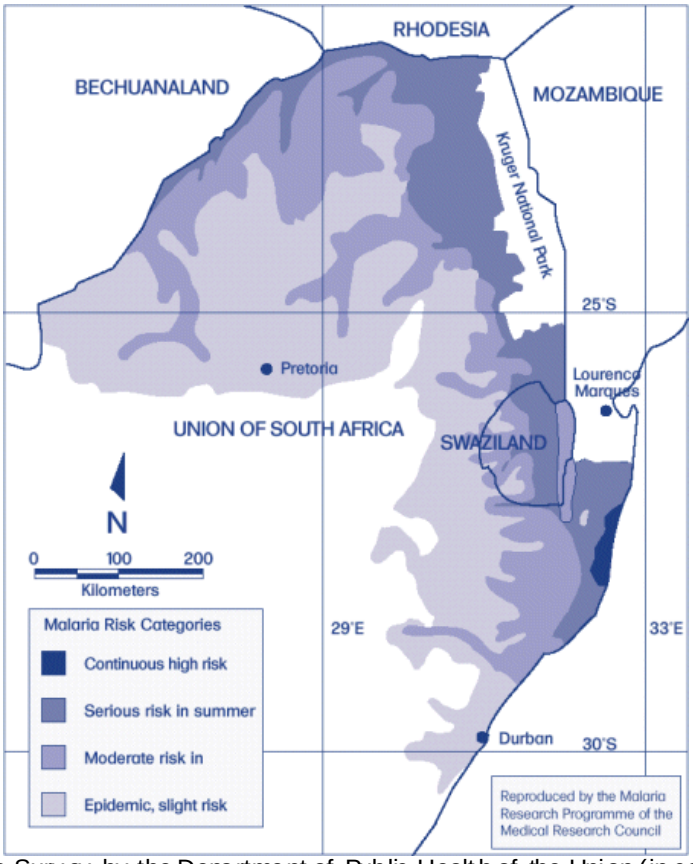
South Africa is not exempt from the potential ravages of malaria with its debilitating effects on communities and development. But malaria reaches into South Africa only at its very fringe, mostly affecting the three northeastern provinces of KwaZulu-Natal, Mpumalanga and Limpopo.

Due to the local climate, malaria transmission follows a distinctly seasonal pattern and experiences marked inter-annual fluctuations resulting in periodic epidemics [1].
An important reason for reviewing the historical profile of a vector borne disease is that it indicates what may happen, should there be a resurgence. It also emphasises the role of and the need for operational research in the development and maintenance of a successful disease intervention programme.

Unless total eradication is achieved, vigilance and stringent control measures must be

maintained to keep the disease in check. The historical distribution of malaria in South Africa is shown in figure 1.3. Control measures were instituted in the malarias areas of South Africa in the late 1940 's. Prior to this, malaria epidemics were recorded as far south as Durban and as far inland as Pretoria on the highveld.

Figure 1.3: Malaria risk in South Africa in 1938, prior to the introduction of disease control



Source: Malaria Survey by the Department of Public Health of the Union (in collaboration in the case of Swaziland, with the Swaziland Administration), 1938

The fact that malaria in South Africa was peripheral, and the tremendous amount of resources invested in its control contributed to the success of the malaria control programme, which rendered large areas practically malaria free and facilitated economic development [1].

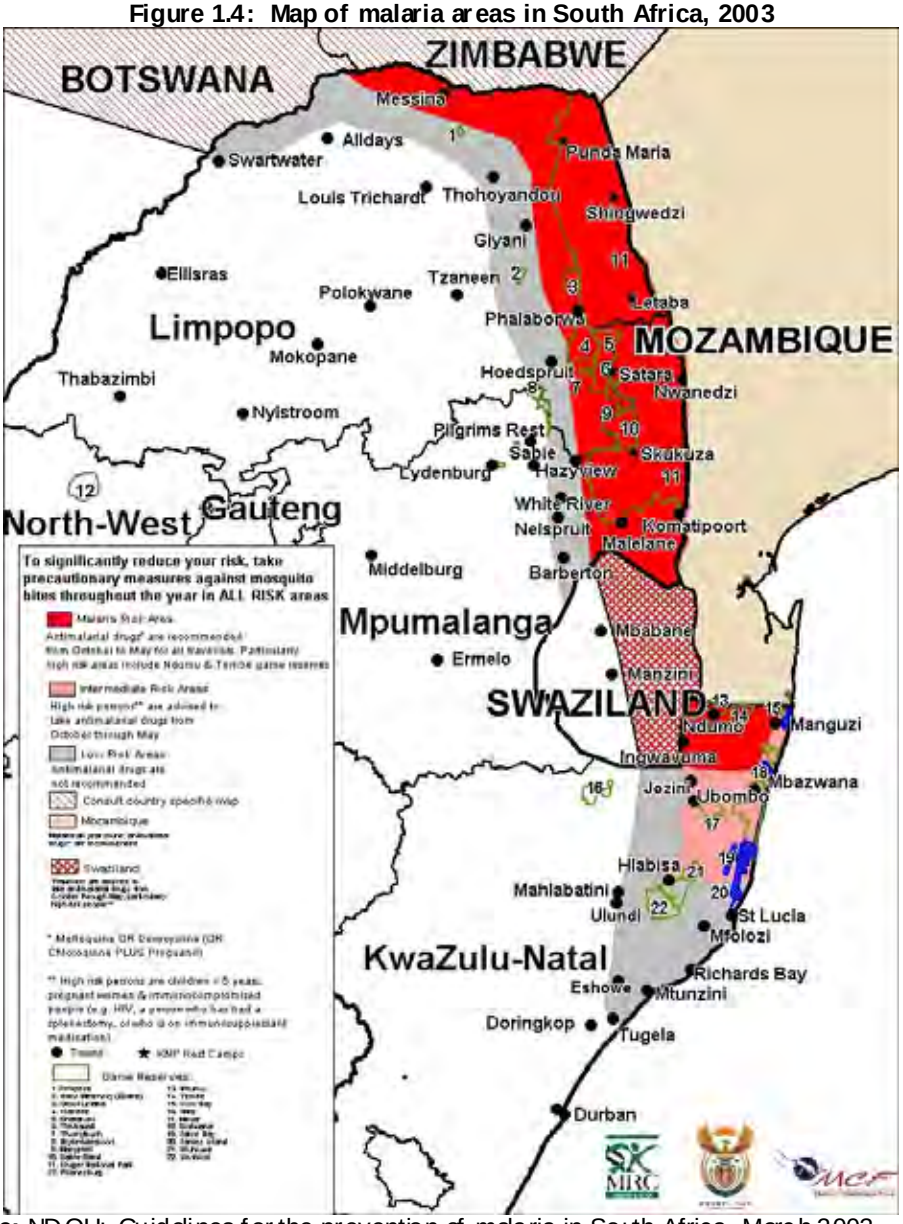
1.5.2 Current situation

Malaria in South Africa is found mainly in Mpumalanga, northern KwaZulu-Natal, and the border areas of the Limpopo and North West provinces (figure 1.4). The risk is at its highest in the wet months between November and April [1].

Studies have also highlighted a change in the geographical patterns of the distribution of malaria in these affected provinces. Most of the high-risk areas for malaria infection are along side the boarders of Mozambique, Swaziland and Zimbabwe. The increased movement in and out of the South Africa boarders possibly

has an effect on these changes in malaria incidence. The percentage of cases reported in the provinces has increased annually despite there being an active control programme in the provinces. The increase may be attributed to several factors namely, resistance to synthetic pyrethroids, migration and drug resistance. Malaria is also a threat in Swaziland, Mozambique, northern Namibia, Zimbabwe and Botswana.

Figure 1.4: Map of malaria areas in South Africa, 2003



Source: NDOH: Guidelines for the prevention of malaria in South Africa, March 2003

1.5.3 Notification

Malaria became a notifiable disease in 1958 and notifications have been captured with varying degrees of completeness since then. Notification data covering all the malaria areas of South Africa are available from 1971 (fig. 1.5), when the malaria control programme became more