

# Tropical Diseases in Saudi Arabia

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## Abstract

The Kingdom of Saudi Arabia, with its vast geographical area, and its location at the boundary of the equatorial, has seen recently several outbreaks of either tropical or Neglected Tropical Diseases (NTD). Being the center of the Islamic world, with millions of pilgrimages visiting the holy sites in Saudi Arabia in the annual sessions of pilgrimage and Umrah, puts the world health at risk of wide and uncontrolled epidemics with its close boundaries with both Yemen and Egypt, which are the most countries in the Middle East region harboring NTD's, puts the Kingdom at an additional risk together with the greenhouse effect of global warming and climate changes. The current status of the NTDs in Saudi Arabia is currently unknown due to several factors of which, poor reporting, lack of proper health workers training and surveillance efforts, being the most important factors. This mini-review will summarize the types of NTD's diseases and current status in Saudi Arabia.

## Introduction

Diseases unique to the tropical and subtropical regions (tropical diseases) are defined as Tropical medicine or International Medicine. More recently the term Neglected Tropical Diseases (NTD) has been introduced through the initiative of the World Health Organization [1]. NTD's (about 17 diseases) are mostly infectious in nature and requires a vector for their propagation, and are prevalent in the tropical and subtropical regions, they were endemic even in countries with cold climates; however with improvement with sanitation, health education and personal hygiene [2], in addition to the cold session, which in part force the vector to hibernation, those diseases have been eliminated or controlled.

NTD's has a heavy burden on public health as they promote poverty, reduced population production, child health, pregnancy and health cost. Each NTD has its own unique etiological features, geographic distribution and public health burden [3,4].

The most common vector for NTD's transmission is insects (mosquitoes and flies), which may carry a parasite, bacterium or virus that is infectious to humans and animals and may act as a biological reservoir for the pathogen multiplication and/or incubator. In common, diseases transmission is caused by an insect "bite", through subcutaneous blood exchange [5].

Recent climate changes, also known as greenhouse effect, in addition to, deforestation, rising immigration and increased

international air travel and other tourism to tropical regions has contributed to an increased incidence of NTD's, which is can cause high incidence of morbidity and mortality [6,7].

The localization of tropical diseases is in poor, underdeveloped countries spanning the tropics, mainly in Africa, Asia, Central America and South America, has led several international efforts to combat those array of devastating diseases. The financial burdens of those diseases are substantial [2,8].

While much of the current international efforts have been focused on four diseases, namely Tuberculosis, Malaria, HIV and Viral hepatitis, much less efforts or research has been geared toward other NTD's. Currently, more than a billion individual is infected globally with NTD's, including 500 million children according to the latest WHO estimate [8].

The Kingdom of Saudi Arabia with its vast borders, and especially its southern borders with close proximity to the African horn and South East Asia, in addition to its subtropical climates, puts the kingdom at risk for an epidemic or endemic episodes of NTD's.

According to recent estimates, the kingdom ranks the highest second country in the Middle East North Africa (MENA) region for Leishmaniasis (*L. major*) infection, with more than 4,000 reported cases; and the third country for Hookworm infection in the region, with 0.4 million reported cases. Lymphatic filariasis also has been reported in Saudi Arabia [9]. Accurate estimates of the NTD's cases in Saudi Arabia are often unavailable, due to health system infrastructure, inefficient reporting system, beside other factors [9].

## Onchocerciasis

It is the world's second leading infectious cause of blindness. It is caused by *Onchocerca* parasitic worm. It is mode of transmission is through black fly. Infection usually spread very rapidly in patients leading to an immune response and destruction of tissue, especially the eye. The prevalence in the Kingdom is currently unknown. Another form of Onchocerciasis, known as Aswad with severe dermatitis and edema is well documented in Yemen; however information about its prevalence in the kingdom is also lacking [10,11].

## Leishmaniasis

Both cutaneous and visceral Leishmaniasis occurs in Saudi

Arabia. The cutaneous type is common throughout the kingdom especially in Eastern and Central provinces [12]. The visceral type which is more virulent is confined to the South and Southwest provinces. Dogs have been identified as the animal reservoir; however, accurate information on the national prevalence of the disease is not known [13]. Several studies have indicated the presence of several hot areas of the diseases in different parts of the country [12,13].

### Toxoplasmosis

(Cat disease) is another important protozoan infection thought to be present throughout the kingdom, with unknown national prevalence [14]. Recent study reported that the seropositivity of 487 pregnant women for *Toxoplasma gondii* infection as high as 38.8% in the south western region of Saudi Arabia [14]. Toxoplasmosis infection was also reported in other regions of the country [15-17]. Toxoplasmosis infection is also reported to be widely spread between animal species in Riyadh region [18]. Toxoplasmosis is currently considered as a global health threat as it infects 40-50% of the world population [19].

### Brucellosis

It is a major health concern in Saudi Arabia. Its high prevalence has been largely attributed to the social norms of the nomadic population who live in close proximity with livestock and consume raw milk, additionally, associated breakdowns in veterinary health control systems and unrestricted animal transportation through open borders have promoted the re-emergence of brucellosis in the Kingdom [20,21]. National prevalence of the infection spread is currently unknown [9].

### Dengue Virus (DENV)

A mosquito's transmitted disease is endemic in the western and southern regions of the Kingdom, with outbreaks occurring in 2006 and 2008. Recent studies indicated the persistent endemic in the southern and western regions [22,23]. Three strains of the 4 DENV strains were reported in the region and also in neighboring Yemen [24]. Climate changes, increasing work force from DENV endemic areas, plus increased urbanization will eventually leads to increased risks of future outbreaks.

### Rift Valley fever (RVF)

It is also a mosquito's transmitted disease caused an outbreak in 2000 in the Jazan region and other parts of the Kingdom [25]. This was the first recorded outbreak outside of Africa, affecting several thousand animals and resulting in approximately 1,000 positive cases and several hundred deaths [26]. Public health measure untaken to combat the spread of the disease seems to be working and should be maintained [27].

### Alkhurma Hemorrhagic Fever (AHFV)

It is caused by a tick-borne flavivirus, has also emerged on the Kingdom in the Najran region in 1996. The knowledge gaps about those viruses are still wide [28]. Recent reports indicate that the epidemiology of the diseases is spreading among the population and is moving outside its geographic areas [29].

### Trypanosomiasis

Prevalence of African Trypanosomiasis infection in humans, which is a parasitic disease, caused by protozoa called trypanosomes and transmitted by the tsetse fly, is unknown in the Kingdom [9]. Increased prevalence in animals and livestock was noted in many animal species including camels, sheep and cattle's. Jazan region showed the highest level of infection rate of camels of 40% with new species identified for the first time in the country [30].

### Lymphatic filariasis

It is well documented in Yemen, is a parasitic disease caused by parasitic filarial worms transmitted by mosquitoes. *Loa loa* is another filarial parasite transmitted by the deer fly. However, the prevalence in the Kingdom is unknown.

### Malaria

It has been documented as a major health problem in several regions of the Kingdom. Malaria is caused by a Protozoan parasites transmitted by female Anopheles mosquitoes. The population at risk of malaria in the Kingdom is estimated to be 1.4 million and malaria epidemics frequently occur after heavy rains sessions. On other hand, the existence of malaria in Southwestern region of the Kingdom is greatly affected by the active and continues importation of cases and vectors from Yemen. Malaria vector control has been the focal aim for the health authorities, Agriculture and local authorities. With the emergence of drug resistant strains, the efforts should be maximized.

Both intestinal and urinary Schistosomiasis has been prevalent in Saudi Arabia. Schistosomiasis is a parasitic disease caused by several species of flatworm. Despite rigorous combating efforts of the diseases in the kingdom, the current prevalence and hot areas of the disease is unknown.

### Tuberculosis (TB)

It is a bacterial infection of the lungs or other tissues, which is highly prevalent in the world, with mortality rate of over 50% if untreated. It is a communicable disease, transmitted by aerosol expectorant from a cough, sneeze, speak, kiss, or spit. Over one-third of the world's population has been infected by the TB bacterium. The situation of TB in Saudi Arabia is unique. The country has interesting and special population dynamics. There are up to ten million expatriates mainly from endemic regions, in South and South East Asia and over two million pilgrims visiting the holy cities located in the western region of the Kingdom each year, with the majority of pilgrims coming from endemic areas. The current status of TB in the kingdom is unknown, especially the new drug resistant strains.

While medical therapeutics and vaccines are the first line of defense against tropical diseases, and despite the success of vaccine development and manufacturing globally in combating many diseases and alleviating the socioeconomic burden of those diseases on public health, the need for more vaccine research and development in tropical medicine is at its peak currently, as evident by the race to develop an HIV, Hepatitis C or Malaria vaccines are underway.

While vaccine development is a highly complex and lengthy process as it may take from 10 to 12 years, and involve multiple stages. The first stage involves the isolation of the pathogen including all of its variants, and identifies the antigens. The second stage is a preclinical stage which begins with antigen characterization and purification to develop appropriate vaccine candidates. Animal studies are used to determine the immunogenicity and safety of the candidate's vaccine.

Another area of concern is the lack of rapid diagnostic devices to screen large number of patients rapidly and cost effectively with superior analytical and clinical sensitivity and specificity in case of sudden outbreaks.

Tropical disease research is lacking in the Kingdom and the region in general, where approximately more than 90% of human and veterinary medicine or vaccines are imported, which poses a serious public health burden and threat. Depending on foreign suppliers is plagued by many risks of sudden outbreak, faulty manufacturing, and surge in demands globally or market shift. The Kingdom is in perfect position to lead international efforts on tropical diseases research.

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