# Malaria Control in the Kingdom of Saudi Arabia

Currently, about 1.6 million people live in areas of Kingdom of Saudi Arabia where malaria is transmitted. In the southwestern region (Tihama), *Plasmodium falciparum* causes over 90% of cases and in the northwestern region 35% of malaria cases. *P. vivax* is a predominant species in the northwest and accounts for over 50% of the cases, whereas *P. malariae* is scarce (1-2% of the cases in KSA). The peak of malaria transmission occurs between October and April and coincides with the rainy season (70-550 mm/year). There is a noticeable decline in the incidence of malaria during summer months. Although KSA is a dry country, permanent springs in the central and eastern regions, and streams that traverse the coastal mountainous range along the Red Sea provide suitable breeding places for Anopheline mosquitoes.

Geographically, malaria endemicity in KSA can be divided into four categories (Figure): Non-malarious areas in Central KSA (associated with low density of *Anopheles sergentii*) where only occasional imported cases are reported every year; areas where transmission of malaria has been halted by institution of effective control measures in Eastern and Northern KSA (*An. superpictus* and *An. stephensi*); areas with low malaria incidence (1 to 3 per 1,000 per year [foci in remote areas in western KSA] *An. superpictus* and *An. sergentii*), and some parts of the southern KSA (*An. arabiensis*); and areas with medium or high malaria incidence (>3 per 1,000/ year [foothills and lowlands of Tihama and the coastal plain along the Red Sea in the southern and southwestern KSA down to the border with Yemen] *An. arabiensis* and *An sergentii*).

Malaria control activities were started in 1948 in the Eastern Province around the oil fields by ARAMCO oil company. A joint Saudi-World Health Organization pilot malaria control project was launched in March 1952. In 1956, national malaria control services were established. Instituted malaria control activities included spraying residential houses with D.D.T. in hyperendemic areas (annual parasite rate >10 per 1000 inhabitants). Mass drug distribution stopped in 1992. *An. arabiensis* developed resistance to D.D.T. in Gizan, and a switch to Fenitrothion was made in 1987. Other control measures include weekly application of larvicides (Temephos 500 EC), ultra low volume space spraying, and treatment of malaria cases.

Ongoing malaria control activities focus on evaluation of newly applied insecticides and evaluation of new biological control measures (susceptibility of the anophelines to adulticides, larvicides, chemical and bio-larvicides (e.g., indigenous fish species and *Bacillus thuringiensis*). Use of impregnated bed nets is being assessed. The susceptibility of *P. falciparum* to 4-aminoquinolines is periodically monitored. Training and refresher courses are organized in the Malaria Research and Training Center in Gizan to upgrade the quality of field operations. Trainees include medical officers, health inspectors, laboratory technicians and students in health institutes. Public health education is done to help encourage community participation in the malaria control program.

The progress made in malaria control in KSA has resulted in the interruption of malaria in the Eastern and Northern provinces since 1972 and in the greater parts of the Western province since 1970. Over 2.5 million people living in areas previously known to be malarious have been protected. In other areas epidemiological indicators have shown a substantial decline in the incidence of the malaria. The malaria surveillance system is credited with prompt control and investigation of emerging outbreaks of malaria.

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**Figure.** Malaria endemicity in Saudi Arabia, 1995.