

World Malaria Day Our story with malaria in Oman

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اليوم العالمي للملاريا قصتنا مع الملاريا في عمان

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MALARIA CASES ARE GENERALLY DIVIDED into imported or local cases, with local cases further subdivided into introduced (i.e. imported infections which are then transmitted locally due to vectors such as mosquitoes), induced (i.e. other sources of transmission such as infected blood transfusions) and indigenous (i.e. *de novo* cases).¹ Globally, there were approximately 212 million cases of malaria in 2015, with an estimated 429,000 malaria-related deaths.² On the occasion of World Malaria Day, which was recently celebrated on 25 April 2017, we saw yet another challenge incorporated into the existing malaria burden this year—the potential addition of the *Plasmodium simium* parasite to the *Plasmodium* species already known to infect humans.³

Malaria used to be endemic in Oman; early reports from 1916 indicate that there were 100–400 cases of fever each month per 1,000 troops based in Muscat, the capital city, with most fevers due to *Plasmodium falciparum* infections.⁴ Moreover, in the 1950s and 1960s, almost one-third of the Omani population had malaria.⁵ Parasitological surveys conducted in the 1970s revealed that much of the northern areas of the country were mesoendemic for malaria, with the highest rates reported in the Al Batinah region where parasite rates of 13% were detected among Omani schoolchildren.⁵

In 1975, a malaria control programme was initiated in Oman with financial assistance from the United Nations Development Programme; by 1979, 17 malaria units and a malaria training centre had been established.⁵ This first malaria control programme had several key objectives, although it was aimed principally at source reduction via the biological control of the indigenous larvivorous fish *Aphanius dispar*. Unfortunately, this strategy showed only partial success and was replaced by widespread use of larvicides containing temephos between 1977–1979.⁵ In addition, the detailed mapping of high-

risk areas with aerial photography to keep track of larval control was a key feature of the vector control programme. In collaboration with the Ministry of Education, schoolchildren in certain highly endemic areas were given weekly chloroquine prophylaxis treatments between 1973 and 1979.⁵ However, this was discontinued in 1980, due in part to fears of emerging drug resistance, with chloroquine thereafter reserved for use among pregnant women and young children. In 1976, dichlorodiphenyltrichloroethane (DDT) residual spraying was implemented, but was replaced with phosphorothioate insecticides in 1993 following the emergence of DDT-resistant vectors in 1980. Nonetheless, by 2003, *Anopheles culicifacies* insects were resistant to both of these insecticides.⁵

In 1991, the Omani Ministry of Health (MOH) launched a new malaria eradication programme, with the ambition of completely interrupting malaria transmission and eliminating the existing reservoir of infected cases.⁶ Once again, the programme was almost entirely focused on source reduction using temephos; however, 231 peripheral government health facilities and 500 private healthcare institutions were also passively screened in an attempt to identify and control existing malaria cases.⁵ In addition, all travellers arriving from East African nations at the international airport were evaluated for malaria before being allowed into the country. By 1999, the annual incidence of locally-acquired malaria had dropped from 21.5 to 0.1 per 10,000 individuals, with approximately 77% of the population targeted by malaria elimination strategies.⁵ Between 2004 and 2006, there were no malaria cases reported in Oman; however, in 2007, 12 cases were detected.⁵ In 2016, 803 cases were reported, three of which were local and were introduced due to the storage of drinking water tanks at construction sites, which served as a good breeding site for mosquitoes.⁷ Isolated outbreaks of malaria continue to be reported in Oman to date.⁵

Complete malaria eradication mandates complete elimination of the mosquito vector, which appears to be impossible. Moreover, the declaration of malaria eradication in some countries has led to a laxity in surveillance programmes, resulting in the re-emergence of malaria cases.⁸ In Oman, plans were therefore redirected towards the control of malaria rather than its eradication. Currently, a strong surveillance system is in place for the early detection and treatment of all reported cases as well as prompt epidemiological investigation of known patients.⁵ The diagnosis of malaria at major health institutions in Oman is mainly based on blood films and rapid diagnostic tests, with molecular testing not widely used by most health institutes. Moreover, malaria prophylaxis is provided to all Omani nationals travelling to Africa or other malaria-endemic countries by local health centres, although it is not compulsory and not all individuals may utilise such services; this may be because the public is not adequately aware of the need for preventative treatment or because some individuals think they are protected due to their frequent visits to endemic areas.^{9,10}

In addition to successfully controlling this once-endemic disease, the Department of Malaria Eradication at the Omani MOH is officially recognised by the World Health Organization as a centre of excellence for malaria microscopy in the Eastern Mediterranean region and training programmes in malaria microscopy were held for neighbouring countries in the region until 2014.¹¹ In conclusion, although we have not achieved complete eradication, the story of malaria control in Oman is one of success.

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