



ELSEVIER



www.elsevierhealth.com/journals/jinf

LEADING ARTICLE

## New guidelines on malaria prevention: A summary

Claire A. Swales<sup>a,\*</sup>, Peter L. Chiodini<sup>b</sup>, Barbara A. Bannister<sup>c</sup>, on behalf of The Health Protection Agency Advisory Committee on Malaria Prevention in UK Travellers

<sup>a</sup> The Health Protection Agency, Expert Advice Support Office, 61 Colindale Avenue, London NW9 5EQ, UK

<sup>b</sup> Hospital for Tropical Diseases, Mortimer Market, Capper Street off Tottenham Court Road, London WC1E 6JB, UK

<sup>c</sup> Royal Free Hospital, Infection Services, Pond Street, Hampstead, London NW3 2QG, UK

Accepted 11 December 2006

### KEYWORDS

Malaria;  
Malaria prevention;  
Chemoprophylaxis;  
Visiting friends and relatives;  
Drug resistance;  
DEET;  
Bite prevention;  
Bed nets;  
Emergency standby treatment

**Summary** Travellers to many tropical areas remain at risk of contracting malaria. Resistance of malaria parasites to a number of drugs continues to increase in degree and distribution, so that some older, trusted prophylactic drugs, such as chloroquine, are no longer useful in some parts of the world. Despite the introduction of new drugs and the reduction of malaria risk in some areas, such as parts of India, the number of people travelling continues to increase and malaria reports in the UK are not decreasing. New updated prevention guidelines from the Health Protection Agency Advisory Committee on Malaria Prevention (ACMP) in UK travellers (Chiodini P, Hill D, Lalloo D, Lea G, Walker E, Whitty C, et al. Guidelines for malaria prevention in travellers from the United Kingdom. London: Health Protection Agency; January 2007. Available from: [http://www.hpa.org.uk/infections/topics\\_az/malaria/default.htm](http://www.hpa.org.uk/infections/topics_az/malaria/default.htm)) aim to raise awareness of the risks of malaria and help UK travel health advisors in giving malaria prevention advice to all those who need it. Together with the ACMP malaria treatment guidelines it is hoped that the risk of illness and death from malaria in UK travellers can be reduced. This article summarises the new ACMP malaria prevention guidelines.

Malaria is a serious febrile illness due to infection of red blood cells with one of the four species of *Plasmodium* which commonly infects humans. *Plasmodium falciparum* is the most dangerous, as it is capable of causing high parasitaemias, resulting in severe and complicated disease. Complicated *P. falciparum* malaria has a fatality rate of

around 15%.<sup>1,2</sup> *P. falciparum* was responsible for 1338 of the 1754 malaria cases imported into the UK in 2005.<sup>3</sup> Anyone visiting a malarious area can become infected regardless of age, sex or ethnic background. Malaria can kill very quickly if not diagnosed early and in 2005 there were 11 deaths due to malaria in the UK.<sup>3</sup>

The new guidelines<sup>4</sup> combine and update previous ACMP publications<sup>5,6</sup> to give clear practical guidance in a user friendly web and book format for healthcare workers,

\* Corresponding author. Tel.: +44 02083276688.

E-mail address: [claire.swales@hpa.org.uk](mailto:claire.swales@hpa.org.uk) (C.A. Swales).

such as GPs, nurses and pharmacists, who are consulted by an increasingly diverse range of people needing travel advice. The web version contains country maps (a selection of which are provided in the book). These show areas of malaria risk and give information on appropriate drugs to take during visits to different areas. They can be consulted alongside pages covering general issues on the ABCD of malaria prevention (*awareness of risk, bite prevention, chemoprophylaxis and diagnosis and treatment*). The guidelines provide the following: advice for special medical needs groups; advice for different types of traveller; frequently asked questions and a listing of information resources. Updates include the latest, extensively revised, ACMP advice for travellers to the Indian sub-continent as shown in Table 1.

## Awareness of risk

The distribution of *P. falciparum* is summarised in the ACMP country tables with specific comments on the extent and severity of drug resistance.

Factors affecting the risk of being bitten by a malaria carrying mosquito in a malarious area include temperature, altitude and season. Although malaria prevalence is generally higher in rural than in urban areas, the risk of contracting malaria in cities must not be discounted. Traveller activities and method of travel also play a part. For instance outdoor activities between dusk and dawn, when mosquito activity is at its peak, carry a high risk, and backpackers have a higher risk of being bitten compared

with tourists staying in air-conditioned hotels and travelling in air-conditioned buses. In general *the longer the stay, the higher the risk of being bitten and therefore of contracting malaria*: this provides a strong case for effective bite prevention as the first line of defence against malarial infection.

An important category of risk covered by the guidelines includes those "visiting friends and relatives" (also known as VFRs). In the UK, malaria predominantly affects the non-UK born population and their families, particularly those from Africa and South Asia. They tend to travel to malarious areas more frequently than others and are significantly less likely to take antimalarial prophylaxis than other travellers to Africa.<sup>7</sup>

Awareness needs to be raised, particularly among those travelling to visit friends and relatives, that malaria is not a trivial disease. Those born in malarious countries need to know that any immunity they may have acquired is rapidly lost after migration to the UK. The view that this group is relatively protected is a dangerous myth. Migrants from malarious areas also need to be made aware that second-generation members of their families have no clinically relevant immunity to malaria, and that their children are particularly vulnerable.

## Bite prevention

The ACMP advises the use of up to 50% concentrations of DEET although other repellents are available if DEET cannot be used. Given the seriousness of malaria in pregnancy,

**Table 1** Malaria chemoprophylaxis in South Asia

Risk	Country	ACMP-recommended regimen	Alternative regimen if recommended regimen unsuitable
Risk high Chloroquine resistance high	<i>Bangladesh</i> (only in Chittagong Hill Tract Districts) <i>India</i> (Assam)	Mefloquine OR Doxycycline OR Atovaquone/Proguanil	Chloroquine plus Proguanil
Risk variable Chloroquine resistance usually moderate	<i>Bhutan</i> (southern districts only) <i>India</i> (except for Assam where high risk, and for areas listed below where low risk) <i>Nepal</i> (below 1500 m, especially Terai Districts; no risk in Kathmandu) <i>Pakistan</i> (below 2000 m) <i>Sri Lanka</i> (risk north of Vavuniya)	Chloroquine plus Proguanil	Mefloquine OR Doxycycline OR Atovaquone/Proguanil
Risk low	<i>Bangladesh</i> (except Chittagong Hill Tracts, see above) <i>India</i> (low risk in southern states of Kerala; Tamil Nadu; Karnataka; Goa and Southern Andhra Pradesh including Hyderabad and the city of Mumbai (Bombay). Low to no risk in northern states of Rajasthan; Uttar Pradesh; Haryana; Punjab; Delhi; Uttaraanchal; Himachal Pradesh; Jammu and Kashmir) For other areas see above <i>Sri Lanka</i> (low risk in all areas except north of Vavuniya, see above)	Awareness of small risk of malaria; avoid mosquito bites and seek medical attention for any suspicious symptoms (up to about a year later) but tablets not considered necessary	

ACMP recommends the use of DEET as part of the malaria prevention regimen for pregnant women, including those in the first trimester. DEET may be used on infants from the age of 2 months.

The ACMP does not recommend oil of citronella as a repellent as its effect is very short-lasting. There is no evidence that taking vitamin B1, marmite or garlic orally or using proprietary bath oils has any repellent effect. Buzzers are also not effective for repelling mosquitoes.

Furthermore the ACMP strongly advises against relying on herbal or homoeopathic remedies for the prevention of malaria.

Insecticides such as permethrin and other synthetic pyrethroids have a rapid knock-down effect on mosquitoes and also have repellent properties. A bed net should be used unless the accommodation is fitted with well-maintained mesh screening over doors and windows or has functioning air-conditioning and doors and windows which are sufficiently well sealed to prevent mosquito entry. Advice on clothing and general room protection is also given.

## Chemoprophylaxis

The principles of chemoprophylaxis and information on the drugs used are summarised by drug in the guidelines, including efficacy, side-effects, interactions and contraindications, cautions and methods of administration.

Emergency standby treatment should only be recommended for those taking chemoprophylaxis and visiting remote areas where they are unlikely to be within 24 h of medical attention. Travellers in this situation who suspect that they have caught malaria should be advised to take their standby treatment, following the instructions for use carefully, and seek medical attention as soon as possible for full assessment and to exclude other serious causes of fever. The agent used for emergency standby treatment should be different from the drugs used for chemoprophylaxis, both to minimise drug toxicity and due to WHO concerns over drug resistance. ACMP-recommended regimens and use of emergency standby treatment are given. Individuals for whom emergency standby treatment is advised should be provided with written instructions of its use; a leaflet is available to download.

ACMP advises against purchasing of antimalarial drugs in the tropics due to fears they may be counterfeit and travellers should obtain the medication required for their chemoprophylaxis from a reputable source in the UK before they travel.

## Diagnosis

Suspected malaria is a medical emergency. Clinical features and physical signs are not reliable in diagnosing malaria. Fever is usual but absence of fever itself does not exclude the diagnosis in a severely ill patient. There is a risk of misdiagnosing malaria as influenza or other acute viral illness, hepatitis A, gastroenteritis or lower respiratory tract infection. Therefore malaria must be considered in anyone who has returned from the tropics in the previous year and for those returning from the tropics *with a fever*

their illness must be considered as malaria unless proven otherwise. The prevention guidelines now contain advice on the diagnostic blood tests, and how to obtain and interpret them. The ACMP has also produced guidance on the treatment of malaria in the UK (published in this journal).

## Special groups of medical condition

Pregnant women have an increased risk of developing severe malaria and a higher risk of fatality compared to non-pregnant women. Diagnosis of falciparum malaria in pregnancy can be particularly difficult, as parasitaemia may be falsely low or absent. Expert advice is required at an early stage if malaria is suspected in a pregnant woman. Complications, including severe haemolytic anaemia, hypoglycaemia, jaundice, renal failure, hyperpyrexia and pulmonary oedema can result in miscarriage, premature delivery, maternal and/or neonatal death. Congenital malaria is rare, but occurs more commonly with *Plasmodium vivax* than with the other malaria parasites of humans.

Given these risks, pregnant women are usually advised to avoid travel to malarious areas. In the event that travel is unavoidable, the pregnant traveller must be fully informed of the risks which malaria presents and the risks and benefits of antimalarial chemoprophylaxis. Avoidance of mosquito bites is extremely important in pregnancy and women should adhere rigorously to bite precautions, and use DEET as the repellent of choice. Nursing mothers should wash repellents off their hands and breast skin prior to handling infants. Guidance on choosing a chemoprophylactic agent for use in pregnancy is given in the guidelines although further expert advice on the use of mefloquine especially in the first trimester should also be sought. Women who have taken mefloquine inadvertently prior to or during the first trimester should be advised that this does not constitute an indication to terminate the pregnancy.

The guidelines also contain advice for women who are breastfeeding, people on anticoagulants or smoking cessation drugs, those with epilepsy, glucose-6-phosphate dehydrogenase deficiency, sickle cell disease, for immunocompromised travellers, travellers with liver disease, renal impairment, splenectomy and those with acute porphyrias.

## Special categories

The advisor will find categories on children, the elderly traveller, those embarking on trips involving several malarious areas with differing risks, cruises, working on oil rigs, visiting national parks, making stopovers, and travelling at the last minute, those visiting friends and relatives (VFRs), students and children at boarding school, long-term travellers such as expatriates and backpackers and finally, long-term visitors to the UK returning to live in malarious parts of the tropics.

Children with malaria are at high risk of complicated disease as they may deteriorate very rapidly to become critically ill. Those looking after children on their return from malarious areas should be made aware that medical attention and a blood test for malaria are needed without delay if a child becomes unwell within a year of leaving a malarious area.

Equally important is the need to ensure meticulous protection against malaria in the first place. Healthcare professionals should strive to improve access to prophylactic advice for families with children, especially those travelling to visit friends and relatives. The child's carers must be helped to understand the importance of ensuring the child adheres to the appropriate medication. Paediatric doses of antimalarials for prophylaxis are given in the guidelines.

These prevention guidelines aim to raise awareness of the risks of malaria and help travel health advisors in giving malaria prevention advice to all those who need it. By providing high-quality practical prevention advice together with the ACMP malaria treatment guidelines it is hoped that the risk of illness and death from malaria in UK travellers can be reduced.

## References

1. Leder K, Black J, O'Brien D, Greenwood Z, Kain KC, Schwartz E, et al. Malaria in travelers: a review of the Geo-Sentinel surveillance network. *Clinical Infectious Diseases* 2004;**39**:1104–12.
2. Mishra SK, Mohanty S, Mohanty A, Das BS. Management of severe and complicated malaria. *Journal of Postgraduate Medicine* 2006;**4**:281–7.
3. Health Protection Agency (HPA). Malaria imported into the United Kingdom in 2005: implications for those advising travellers. *CDR Weekly*(23). News. Available from the CDR Weekly archives at: <http://www.hpa.org.uk/cdr/default.htm>; 2006;**16**.
4. Chiodini P, Hill D, Laloo D, Lea G, Walker E, Whitty C, et al. *Guidelines for malaria prevention in travellers from the United Kingdom*. London: Health Protection Agency. Available from: [http://www.hpa.org.uk/infections/topics\\_az/malaria/default.htm](http://www.hpa.org.uk/infections/topics_az/malaria/default.htm); January 2007.
5. Bradley DJ, Bannister B. Health Protection Agency Advisory Committee on Malaria Prevention for UK Travellers. Guidelines for malaria prevention in travellers from the United Kingdom for 2003. *Communicable Disease and Public Health* 2003;**6**: 180–99.
6. Hughes C, Tucker R, Bannister B, Bradley DJ. Malaria prophylaxis for long-term travellers. *Communicable Disease and Public Health* 2003;**6**:200–8.
7. Health Protection Agency. *Migrant Health: infectious diseases in non-UK born populations in England, Wales and Northern Ireland. A baseline report – 2006*. London: Health Protection Agency Centre for Infections; 2006.