Epidemiology of Malaria in European Travelers

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Malaria Risk in Travelers

Malaria imposes an increasing risk to travelers, due primarily to the expansion of travel to highly endemic areas. Concomitantly, the spread of resistance to safe chemoprophylaxis and the diminished use of more efficacious drug combinations, because of toxicity, necessitates comprehensive and systematic appraisal of malaria risk [1]. In order to develop optimal recommendations to protect European travelers, we need to classify who is at risk and why. A series of questions need to be addressed as a basis for action:

1. **Clarification of the problem:** What is the distribution of malaria in different groups of European travelers in terms of both incidence and incidence rates?
2. **Postulated reasons:** What risk factors are strongly associated with malaria in the different groups?
3. **Modifying influences:** How efficient are the protective measures in modifying risk and under what conditions?
4. **Motivating factors:** What methods enhance maximum uptake and compliance with potentially efficacious measures?
5. **Implementation:** How can results be applied to achieve maximum effect?

Characteristics of Risk

Postulated characteristics of risk to be measured may be classified as risk markers, determinants and modifiers. Risk markers are characteristics that are associated with increased risk but do not, themselves, cause disease. These include age, sex, ethnicity, reason for travel, and occupational class. Markers classify groups for targeting specific recommendations. Determinants characterise travelers' potential exposure to infection. These are the country and place of visit, duration of visit and its temporal association with seasonal endemicity. Modifiers directly influence acquisition of infection and outcome. Principal modifiers are (1) malaria chemoprophylactic drugs, measured with respect to the type and dose, regimen and regularity of use, (2) behavioural and environmental components which inhibit or enhance exposure, including the use of antimosquito measures, (3) immune status which can be discounted as protective for the majority of European travelers, and (4) behaviour and health care intervention if symptoms are manifest.
Survey Designs Used To Collect Data on Travelers

Many different study designs may be used to survey travelers. The main types of studies are (1) Ongoing surveillance either of malaria or of travelers. These can be conducted locally, nationally or internationally. (2) Cross sectional studies monitor travelers to describe their knowledge, attitudes and practices and can provide an estimate of malaria infection. (3) Longitudinal studies use cohorts or repeated cross sectional surveys to detect the impact of preventive advice, the changing pattern of health of travelers, their compliance and determinants that influence compliance. (4) Case control studies measure associations of risk but have limited use when investigating malaria in travelers. (5) Case base linkage studies combine together the denominators and numerators collated from other studies. Limitations of the survey designs and the restrictions imposed by finances and manpower resources, especially in European countries, reduce the methods for investigation of malaria in travelers principally to ongoing surveillance and cross sectional surveys. Measurement of rates is essential to interpret risk of infection in different groups; therefore incidence data need to be applied to denominators. Case base linkage provides the only feasible method of doing this on a large scale. Ongoing surveillance of imported malaria is, therefore, crucial for the determination of risk in travelers. The information collected on each case and the coverage of the surveillance system need to be of the highest calibre attainable to prevent spurious conclusions.

Pattern of Imported Malaria in Europe

Imported Malaria Statistics

Data used to illustrate the malaria situation in Europe originate from the information collected by 27 countries. These have been collated from two sources: (1) a survey of national surveillance systems during 1986–1987 and (2) data collected by the World Health Organisation (WHO).

1. The survey was conducted between 1986 and 1987, by primarily tracing the person responsible for malaria surveillance in each European country. This was achieved by contacting three informants; the Minister of Health, the Chief Epidemiologist of the Department of Health and the Chief of Infectious and Tropical Diseases. A follow-up questionnaire was then sent to the key person responsible requesting a summary of malaria surveillance data compiled for all of the preceding 5 years. A copy of current prevention advice and a description of statistics collected routinely by the national surveillance system was also requested. Twenty-four (88%) of the 27 countries provided information on malaria cases; 60% of them were unable to supply data for the five preceding years. Twenty-three (85%) countries completed the question sheets on prevention advice and routinely collected surveillance data.

2. Secondly a request was made to the Epidemiological Methodology and Evaluation Unit, Malaria Action Programme, WHO, in Geneva, for malaria