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Imported malaria in Scotland – An overview of surveillance, reporting and trends

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Summary *Background:* Imported malaria cases continue to occur and are often underreported. This study assessed reporting of malaria cases and their characteristics in Scotland.
Methods: Cases were identified at the study sites of Aberdeen, Edinburgh, Glasgow and Inverness. The number of cases identified in the period 2003–2008 was compared to surveillance databases from Health Protection Scotland (HPS) and the Malaria Reference Laboratory (MRL). Case characteristics were recorded and analysed.
Results: Of 252 cases of malaria diagnosed and treated, an estimated 235 (93.3%) were reported to the MRL. Between 2006 and 2008, 114 of 126 cases (90.5%) were reported to HPS. *Plasmodium falciparum* caused 173 cases (68.7%). Business and professional travel accounted for 35.3% of cases (higher in Aberdeen), followed by visiting friends and relatives (33.1%) and holiday makers (25.5%). The majority of infections were imported from West Africa and 65.7% of patients for whom data on prophylaxis was available had taken no or inappropriate prophylaxis.
Conclusions: Reporting of malaria in Scotland can be improved. There is a continued need to optimise preventive measures and adherence to chemoprophylaxis amongst business

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travellers, those visiting friends and relatives, and holiday makers in endemic countries in order to reduce imported malaria cases.

Introduction

Worldwide, malaria is a major cause of morbidity and mortality, and *Plasmodium falciparum* represents the commonest potentially fatal parasitic infection imported into the UK. Half of the world's population is thought to be at risk of malaria, with nearly 225 million cases and 781,000 deaths estimated in 2009.[1] Being non-endemic to the United Kingdom, cases typically arise in those returning/arriving from endemic countries ('imported malaria') and often represent a preventable burden of disease. Current guidelines for malaria prevention in the UK involve increasing travellers' awareness of the disease in endemic areas, avoidance of mosquito bites, and compliance with appropriate chemoprophylaxis.[2] In spite of these guidelines there was a significant increase in *P. falciparum* cases in the UK in the 20 years leading up to 2006, corresponding to increased immigration from endemic countries and increased overseas visits, particularly among immigrants visiting friends and relatives in their country of origin.[3–5] This trend continues as recently published figures show.[6]

Approximately 2000 cases of malaria are reported annually in the UK – predominantly caused by *P. falciparum* – with a case fatality ratio of 7.4 deaths per 1000 reported cases.[2,4] In 2009, this UK rate was represented in Scotland by one death from *P. falciparum*.[7] There is little up-to-date literature on the epidemiology of malaria in Scotland alone, but surveillance data suggests it largely follows UK-wide trends.[7–11] Knowledge of the pattern of malaria imported into Scotland can enable appropriate public health measures for the population at risk.

Cases of imported malaria reported to Health Protection Scotland (HPS) are included on their register of Scottish cases. Furthermore, the Malaria Reference Laboratory (MRL) collates data from HPS and the rest of the UK to maintain the national surveillance database of reported cases of malaria in the UK. The MRL also receives direct referrals of samples from laboratories or clinicians for diagnostic or confirmatory purposes. As a notifiable disease, malaria reporting in Scotland depended on clinicians and/or laboratory staff identifying clinical cases through statutory notification to HPS, or by completing standardised reports of supplementary information (destination, reason for travel, chemoprophylaxis etc.) to accompany specimen referrals to the MRL. Because there were previously no clear guidelines on who should report to whom, some cases bypassed HPS or were reported to both HPS and MRL, with the MRL database being seen as the most complete. Equally, patients who presented with signs and symptoms of, and who were successfully treated as malaria with no laboratory confirmation may have been reported as cases. From January 2010 the diagnosing laboratories took over sole responsibility for reporting only confirmed positive isolates in Scotland to HPS and MRL and clinicians are no longer required to notify. It is envisaged that revised criteria for positive malaria cases, in addition to the clear allocation of responsibility, will improve reporting and provide auditable standards.

Under-reporting is a recognised problem in the UK and abroad[12–16] and as the interpretation and usefulness of surveillance data is dependent on the quality and completeness of that data, it is important to periodically review reporting mechanisms and the data they generate if such data are to be of any use in informing policy and practice. This study assesses reporting of imported malaria and considers its characteristics in Scotland. It aims to comment on previous notification mechanisms and to identify at risk population groups for targeted public health intervention in order to reduce the burden of this wholly preventable and curable disease.

Methods

Case identification and data collection

We aimed to identify hospital admissions with the ICD-10 code[17] for malaria for the years 1998–2009 inclusive (time-period prior to the introduction of the new notification mechanism in Scotland). Relevant information was obtained from hospital databases at four study sites: NHS Grampian (Aberdeen: Aberdeen Royal Infirmary, Royal Aberdeen Children's Hospital), NHS Lothian (Edinburgh: Royal Infirmary of Edinburgh, Western General Hospital, St John's Hospital, Royal Hospital for Sick Children), NHS Greater Glasgow and Clyde (Glasgow: Gartnavel General Hospital), and NHS Highland (Inverness: Raigmore Hospital). These four sites are subsequently referred to as Aberdeen, Edinburgh, Glasgow and Inverness. At the Edinburgh and Glasgow study sites cases recorded in respective local haematology laboratory databases were also reviewed. Not every health board in Scotland was covered due to logistical restrictions. The four study sites cover hospitals treating the majority of malaria cases imported into Scotland, primarily in regional Infectious Diseases departments acting as local referral centres. Adjustments to account for malaria episodes in other Scottish hospitals e.g. in NHS Fife or NHS Tayside were made in the reporting analysis.

Case notes were obtained and relevant patient information (age, sex, and ethnicity/country of origin) and disease information (area, purpose and duration of travel, prophylaxis used, malaria species, treatment and mortality) were recorded on a standardised database. Case identification and data collection was performed between January 2009 and May 2010. Cases were anonymised following baseline analysis at each study site. In order to adhere to the audit framework of this study no direct matching of cases from our review with HPS and MRL databases using patient identifiers was performed.