EPIDEMIOLOGY OF MALARIA IN AUSTRALIA 1991 - 1995

Helen Longbottom, AIDS/Communicable Diseases Branch, Commonwealth Department of Human Services and Health, GPO Box 9848 ACT 2601

Abstract

Australia has been certified malaria free since 1981 but the number of imported cases has increased steadily since 1960. Many of these cases are in returning travellers. Data from the National Notifiable Diseases Surveillance System, supplemented by summaries from States and Territories, provide an overview of the epidemiology of malaria in Australia. Between 1991 and 1995 there were 3,480 cases of malaria notified. The male:female ratio was 2.4:1 and the highest rate of notification was recorded for males in the 25 to 29 years age group. The highest number of cases was notified each year in January and February. In the State and Territory reports *Plasmodium vivax* was the predominate species reported and Papua New Guinea the predominate country of acquisition. A number of jurisdictions reported inadequate prophylaxis as a risk factor. Improved malaria surveillance is required to adequately inform travel health advice and to reduce the rates of imported malaria.

Introduction

The World Health Organization (WHO) certified Australia free of malaria in 1981 but the disease is endemic in many parts of the world. It has been estimated that 300-500 million clinical cases occur globally each year. There are 90 countries where malaria is endemic. Almost half of these countries are in sub-Saharan Africa. There is a high incidence of malaria in parts of South-East Asia, India, Central and South America and the Western Pacific[1]. Travellers from endemic areas introduce cases of malaria into Australia each year.

Surveillance data on malaria have been collated nationally since 1917[2]. In 1994 the National Health and Medical Research Council (NHMRC) restated the recommendation that surveillance of malaria be undertaken in Australia[3]. This surveillance serves a number of purposes. It is believed that the environmental conditions in Australia north of latitude 19°S still favour the transmission of malaria were parasites to be re-introduced. Surveillance is required by public health officials in these areas to ensure that malaria is not re-introduced[4]. Surveillance is also required to inform the work of the NHMRC Malaria Working Party which makes recommendations on prophylaxis for travellers, to meet Australia's WHO reporting requirements and to maintain Australia's malaria-free status.

Between 1991 and 1995 there were two systems for surveillance of malaria in Australia: the Australian Malaria Register (AMR) and the National Notifiable Diseases Surveillance System (NNDSS). Both these systems utilise information collected by States and Territories under their public health legislations.

The AMR is co-ordinated by the Tropical Health Program of the University of Queensland and provides comprehensive information on all cases of malaria notified in Australia. The AMR has published annual reports for 1990 and 1991[4,5].

The NNDSS in its current format was established in 1991 under the auspices of the Communicable Diseases Network Australia New Zealand (CDNANZ). The NNDSS data are collated and analysed fortnightly using notifiable diseases information from States and Territories. The NNDSS contains a minimum dataset of nine fields: a unique identifying number; the disease; the age, sex, Aboriginality and postcode of residence of the case; the date of onset of the disease; and the date of report to the State or Territory health authority.

This article reports on cases of malaria reported to the NNDSS between January 1991 and December 1995. The NNDSS dataset for 1995 is provisional. This information has been supplemented by summaries supplied by

Figure 1. Annual rate of notifications of malaria per 100,000 population, 1960 to 1995

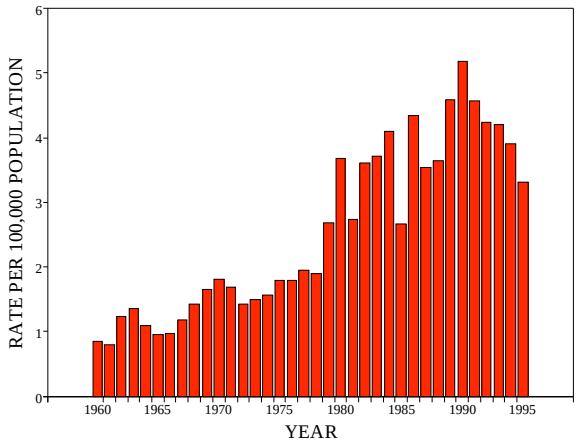
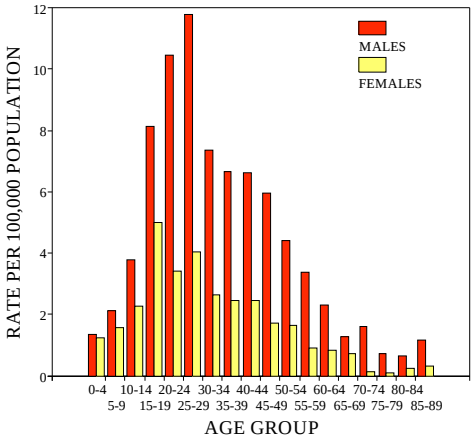


Figure 2. Average annual notification rate of malaria per 100,000 population, 1991 to 1995, by age group and sex



States and Territories about the epidemiology of cases of malaria reported in their jurisdictions. The State and Territory data do not cover the whole period but provide an overview of the epidemiology of malaria in each jurisdiction.

The NHMRC malaria case definition is[3]:

- Demonstration of malaria parasites (*Plasmodium* species) in a blood film.

National Notifiable Diseases Surveillance System

There were 3,480 cases of malaria notified to the NNDSS with onset dates between January 1991 and December 1995. The annual rate of notification decreased slightly after 1991. Historically, there was a steady increase in the rate of notifications of malaria since 1960 with the highest rate recorded for 1990 (5.2 cases per 100,000 population) (Figure 1).

There was a disproportionate number of reports for males, with the male:female ratio 2.4:1. The age group and sex specific notification rates had a bell shaped distribution with the highest rate for males recorded in the 25 to 29 years age group (11.8 cases per 100,000 population). The highest rate for females was in the 15 to 19 years age group (5 cases per 100,000 population) (Figure 2).

A seasonal trend was observed with the highest number of notifications being recorded in January and February each year (Figure 3).

The highest rate of notifications was reported for the statistical division of Far North Queensland (43.5 cases per 100,000 population) (Figure 4).

State and Territory Reports

The Australian Capital Territory - Malaria notifications 1992 to 1994

In the Australian Capital Territory, there were 26 reports of malaria in 1992, 19 in 1993 and 24 in 1994. The male:female ratio was 1.2:1 in 1992. In 1993 and 1994 it was 2.8:1 and 3:1 respectively. The age group distribution was similar to that seen in the national database.

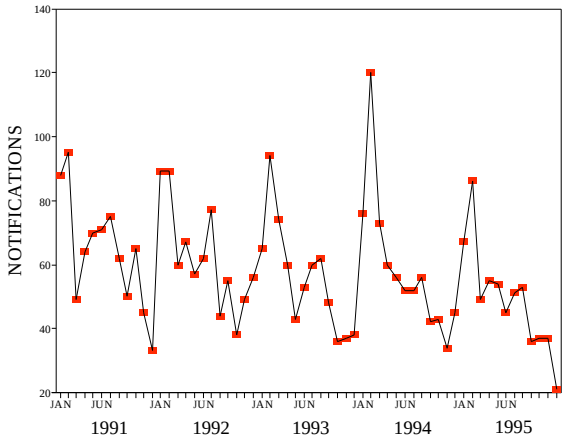
New South Wales - Malaria notifications 1989 to September 1995

There were 1,380 malaria cases reported in New South Wales between January 1989 and September 1995. Seventy-one per cent of the cases were male and 29% female. The median age was 27 years.

Seventy-two per cent (1,001) of the reports were of *Plasmodium vivax* and 22% (309) were *Plasmodium falciparum*. Seventy-one per cent of the cases of *Plasmodium vivax* infection and 23% of the cases of *Plasmodium falciparum* infection had gametocytes in the blood film at the time of diagnosis.

Of the notifications of *Plasmodium vivax* infection, 56% (557) were reported as acquired in Oceania, 18% (184) in South-East Asia, 18% (179) in South Asia and 2% (19) in Africa. Of the notifications of *Plasmodium falciparum* infection, 51% (158) were reported as acquired in Oceania, 31% (96) in Africa, 14% (42) in South-East Asia and 3% (8) in South Asia.

Figure 3. Malaria notifications by month of onset, 1991 to 1995



Data were collected on the use of prophylaxis for 1,185 cases: 68% (800) cases were using prophylaxis and 33% (385) were not. Of those using prophylaxis 29% (228) were using it correctly and 72% (572) were not.

The Northern Territory - Malaria notifications 1985 to September 1995

There were 263 cases of malaria notified in the Northern Territory between 1985 and September 1995. One hundred and forty-four cases were reported as acquired in Papua New Guinea and 119 in Indonesia.

There was a total of 160 cases of *Plasmodium vivax* infection: 62% (99) reported as acquired in Papua New Guinea and 38% (61) in Indonesia. There were 92 cases of *Plasmodium falciparum* infection: 58% (53) reported as acquired in Indonesia and 42% (39) in Papua New Guinea. Between 1990 and 1995 there were 87 notifications of malaria reported as acquired in Papua New Guinea and 91 in Indonesia.

Queensland - Malaria notifications in 1994

There were 285 cases of malaria reported in 1994. The male:female ratio was 2.3:1. There were 187 reports of *Plasmodium vivax*, 92 of *Plasmodium falciparum*, two of *Plasmodium ovale*, two of *Plasmodium malariae* and four indeterminate reports.

Seventy per cent (199) of the reports were for persons who had visited Papua New Guinea, 11% (32) for persons who had visited the Solomon Islands and 4 % (11) for persons who had visited Indonesia.

South Australia - Malaria notifications in 1993 and 1994

South Australia had a total of 57 notifications of malaria in 1993 and 1994. Seventy-two per cent (41) of the notifications were for *Plasmodium vivax* and 23% (13) were for *Plasmodium falciparum*.

Forty-four per cent (18) of the cases of *Plasmodium vivax* infection reported visiting Papua New Guinea and 20% (8) reported visiting India. Forty-six per cent of the cases of *Plasmodium falciparum* infection reported visiting Papua New Guinea.

Tasmania - Malaria notifications 1990 to 1994

Tasmania reported 54 cases of malaria between 1990 and 1994.

There were 66 reports of *Plasmodium vivax*, 13 of *Plasmodium falciparum*, and two of *Plasmodium malariae*.

Victoria - Malaria notifications in 1994

In 1994, 84 cases of malaria were notified in Victoria, compared to 129 in 1992 and 89 in 1993. The male:female ratio was 2.5:1 with the highest number of reports recorded for males in the 20 to 29 years age group.

Of the 84 reports, 64% (54) were of *Plasmodium vivax* and 25% (21) were *Plasmodium falciparum*. Two reports were of mixed *Plasmodium falciparum* and *Plasmodium ovale* infection, four of *Plasmodium ovale*, one of mixed *Plasmodium falciparum* and *Plasmodium vivax* and two indeterminate reports.

Of the cases of *Plasmodium vivax* infection, 35% (19) had visited Papua New Guinea, 24% (13) India and 15% (8) Indonesia. Reports of *Plasmodium vivax* were also received for persons visiting Sri Lanka, Burma, Pakistan, Cambodia, Thailand, Solomon Islands, Vanuatu, Sudan and Argentina.

Thirty-three per cent (7) of the reports of *Plasmodium falciparum* were for persons visiting Papua New Guinea (7) and 19% (4) for persons visiting Indonesia. Reports were also received for persons visiting India, Burma, Solomon Islands, Nigeria, East Africa, South Africa, Zimbabwe, Uganda, Ghana and Kenya.

Fifty per cent (27) of the individuals with *Plasmodium vivax* infection and 67% (14) of the individuals with *Plasmodium falciparum* infection had not taken any prophylaxis.

Western Australia - Malaria notifications 1990 to September 1995

There were 202 notifications of malaria in Western Australia between January 1990 and September 1995. The highest number of reports was received for people in the 25 to 29 years age group.

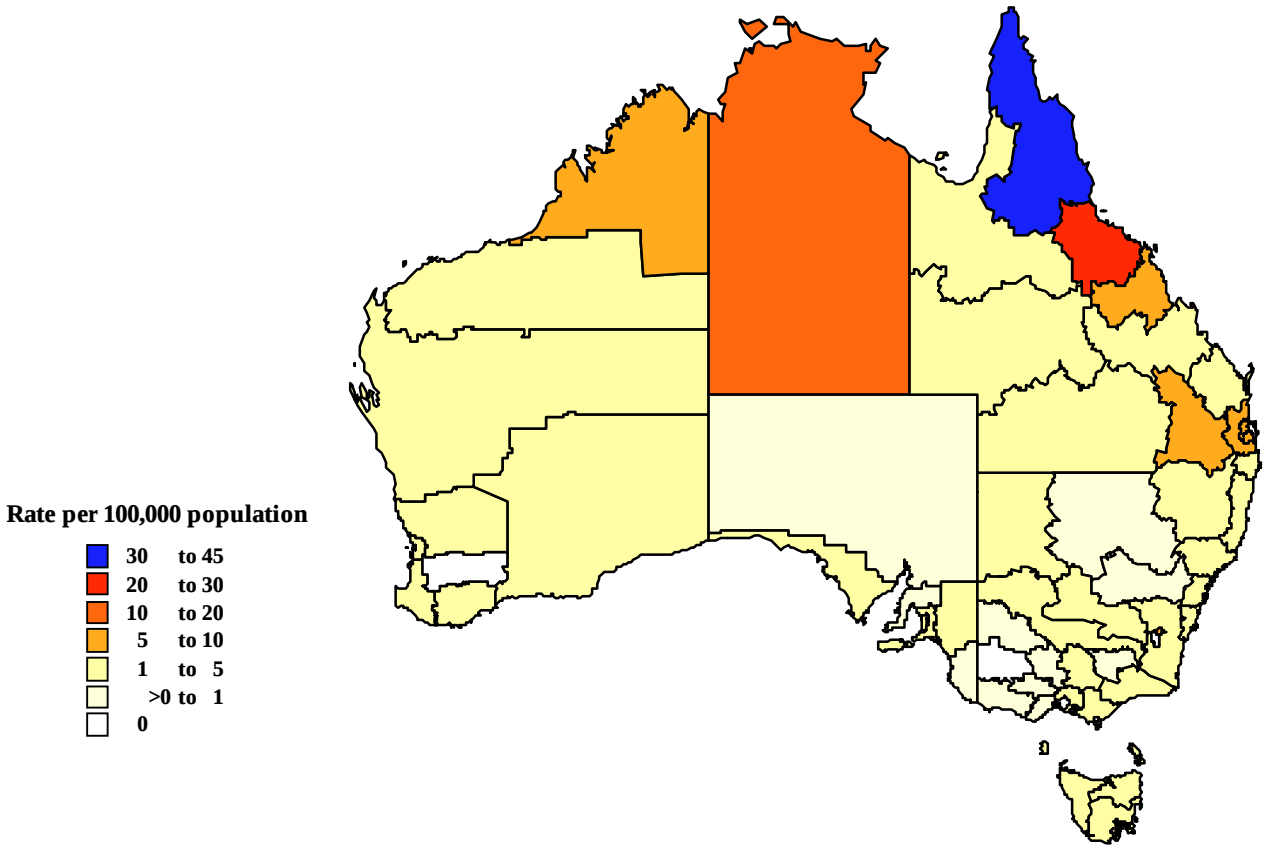
There were 29 reports of *Plasmodium vivax*, six of *Plasmodium falciparum*, two of *Plasmodium malariae*, one of *Plasmodium ovale* and four of mixed infections. For 160 of the reports the species was unknown.

Data on the country of origin of the infection were collected in 1994 and 1995. There were 11 reports of infection acquired in Africa, six in Papua New Guinea, six in Indonesia and two in India.

Discussion

While there have been no reports of indigenous cases of malaria in Australia since 1962[6], the rate of notifications of malaria has steadily increased since the 1960s,

Figure 4. Average annual notification rate of malaria, 1991 to 1995, by statistical division



probably reflecting an increase in the number of travellers to endemic regions. A recent article on overseas travellers reported that 2,299,500 Australians travelled overseas for less than 12 months during 1992 and 1993, with an estimated mean trip duration of 6.3 weeks[7].

The NNDSS data show a disproportionate number of cases in males particularly in the 15 to 29 years age group. This pattern is reflected in the reports from States and Territories. It is probable that this group includes travellers, students and workers. Information on reason for travel was not available for this report.

The seasonal trend observed in the NNDSS is similar to that noted in other reports[4,8]. Analysis by the AMR of 1991 data suggests that this seasonal increase is due to an increase in the number of cases imported from Papua New Guinea in the first few months of the year. Students from endemic areas coming to Australia to commence studies may contribute to the seasonal rise[9].

Plasmodium vivax is the species of malaria responsible for the majority of notifications in the State and Territory reports. Papua New Guinea was most often reported as the country where infection was acquired. This information is similar to the data from the 1991 AMR report[4]. Recent data from the Northern Territory indicate a higher proportion of cases are associated with *Plasmodium falciparum* and with travel to Indonesia.

Public health officials in the 'malaria receptive' zones in the north of Australia have established protocols to follow up each report of malaria in order to ensure that local transmission does not occur.

The provision of appropriate travel health advice is essential to decrease the number of cases of malaria in returning travellers. Information in this report suggests that many travellers do not take adequate prophylaxis. It is important for physicians to take an adequate travel history when treating returning travellers who present with symptoms of malaria and that they follow the appropriate treatment guidelines[10,11].

In 1995 the Commonwealth Department of Human Services and Health, in association with the Australian Medical Association and the Royal Australian College of General Practitioners, conducted a national Travel Safe campaign to increase awareness of travel health recommendations for intending travellers and to provide comprehensive information on travel health to service providers[12]. This type of information is an essential part of health promotion and prevention activities and must be informed by adequate surveillance.

The data from the NNDSS presented in this report provide some basic trend information on the epidemiology of malaria in Australia but these data are inadequate to inform our travel health advisory needs. Additional data are available in States and Territories and are supplied to the AMR but it has been problematic to produce reports in a timely fashion. In October 1995 a meeting was held between the Commonwealth, States and Territories, and the Australian Malaria Register to review national malaria surveillance. This meeting made a number of recommendations to improve the quality and timeliness of malaria surveillance reports. It is anticipated that these recommendations will be implemented in the near future.

If Australia is to decrease the rate of imported malaria in the face of continuing high rates of malaria in many of the countries frequented by Australian travellers, adequate travel health information based on local and international surveillance data is essential.

Acknowledgments

I wish to acknowledge the contributions made by Dr Kath Taylor, Dr Scott Cameron, Clinical Associate Professor Bart Currie, Ms Irene Passaris, Dr John Walker, Dr Jill Rowbottom, Dr Avner Misrachi, Dr Morton Bell and Mr Htoo Myint in the preparation of this report.

References

1. World Malaria situation in 1993. *Wkly Epidemiol Rec* 1996;71:17-22.

2. Hall R. Notifiable diseases surveillance, 1917 to 1991. *Comm Dis Intell* 1993;17:226-236.

3. National Health and Medical Research Council. *Surveillance Case Definitions*. Canberra: Australian Government Publishing Service, 1994.

4. Sleigh A, Srinivasa M, Cooper A, *et al*. *Report of the Australian Malaria Register for 1991*. Herston: Tropical Health Program University of Queensland, 1993.

5. Forsyth S, Leoskow K, Pearce M, *et al*. *Final report of the Australian Malaria Register for 1990*. Herston: Tropical Health Program University of Queensland, 1991.

6. Currie B. The diagnosis and treatment of malaria in Australia. *Aust Fam Physician* 1993;22:1773-1779.

7. Prociv P. Deaths of Australian travellers overseas. *Med J Aust* 1995;163:27-30.

8. Black R. *Malaria in Australia*. Commonwealth Institute of Health, Tropical Medical Technical Paper No 7. Canberra: Australian Government Publishing Service, 1982.

9. Voolmann T, Currie B, Patel M, *et al*. Malaria screening and surveillance in the Northern Territory - Protocols for active screening of students from high risk areas. *Comm Dis Intell* 1994;18:106-107.

10. Pugh C, Del Fante P. Staying healthy while travelling. *Aust Fam Physician* 1994;23:1686, 1689-90, 1693-95.

11. McCall B, Pearce M. Malaria treatment in Queensland, 1992. The use of malaria treatment guidelines. *Med J Aust* 1994;161:259-62.

12. Commonwealth Department of Human Services and Health. *Health information for international travel, 4th Edition*. Canberra: Australian Government Publishing Service, 1995.