Change in Epidemiology of Malaria Infections in a Rural Area in Ethiopia

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We describe a change in epidemiology of 3,615 cases of malaria in a rural area in Ethiopia (from September 11, 1998, through September 10, 2003). The Plasmodium falciparum infection increased from 40.9% in the first year to 73.4% in the last year, and the Plasmodium vivax infection decreased from 54.7% to 22.4% (p < .001).

A high number of malaria cases among travelers returning from Ethiopia have been described. The infection has been mainly due to Plasmodium vivax. In more than one-third of the infected travelers, the malaria occurred > 2 months after traveling. Two-thirds of the patients had used the correct chemoprophylaxis appropriately. Most travelers to Ethiopia spent at least 1 night in a rural area of south Ethiopia, exposing themselves to the risk of acquiring malaria infection.

In Ethiopia there are two main seasons for the transmission of malaria: September to December and March to May. Plasmodium falciparum accounts for about 60% of the cases of malaria; P. vivax accounts for about 40%. We wish to report our experience with malaria infection over a period of 5 years, from September 11, 1998, through September 10, 2003 (from 1991 through 1996 on the Ethiopian calendar), in a rural hospital located 250 km south of Addis Ababa in the Rift Valley. Throughout the study period, the techniques used to diagnose malaria did not change and were performed by the same three laboratory technicians.

During the period of study, 3,615 cases of confirmed malaria were diagnosed at Gambo General Rural Hospital, Shashemane, Ethiopia. There were 1,707 cases (47.2%) involving P. vivax infection, 1,684 cases (46.6%) involving P. falciparum, and 224 cases involving infection with both species of Plasmodium. Table 1 gives the distribution of Plasmodium species during this period. The percentage of cases involving P. falciparum infection increased from 40.9% in the first year to 73.4% in the last year, and the incidence of P. vivax infection decreased from 54.7 to 22.4% (χ²-tendencies = 196; p < .001). When also considering the cases caused by both Plasmodium species, the prevalence of P. falciparum infection increased from 45.5 to 77.6%, and that of P. vivax infection decreased from 59.1 to 26.6% (χ²-tendencies = 206; p < .001).

During the period of study, the number of cases varied. There was a decrease from the first to the second year and an increase during the last year. These changes were not caused by variations in the health structure, preventive laboratory procedures, or interventions, and we consider that they are similar to those that occurred in other areas of Ethiopia. In many areas of Ethiopia, the malaria risk is epidemic with spatial and temporal variations. Epidemic risk is a dynamic phenomenon associated with several factors including the weather (high temperatures and rainfall) and ecoepidemiologic characteristics in the area.

We also observed that there was a significant decrease in P. vivax and an increase in P. falciparum. This switch from the previously predominant P. vivax to P. falciparum has been reported in other areas of Ethiopia. But what has caused the change in ratio between the two species? We are not able to answer this question. However, although we have no information about the Anopheles population in this area, this species may contribute to the change in epidemiology of Plasmodium species in the same area.
entomologic study should be done to investigate this phenomenon.

The epidemiology of malaria changes with an increase in \textit{P. falciparum} infections, but \textit{P. vivax} and combined malaria are common and should be considered when a traveler is seen upon return from Ethiopia. However, the data from one single health center may not be considered a basis on which to make an antimalarial recommendation for an entire country. We consider that these results should be compared with those from other areas and health centers.

**Declaration of Interests**

The authors have no financial or other interests to disclose.

### Table 1 Tendencies of Cases of Malaria in Ethiopia

<table>
<thead>
<tr>
<th>Period</th>
<th>\textit{P. falciparum}</th>
<th>\textit{P. vivax}</th>
<th>\textit{P. falciparum} and \textit{P. vivax}</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 11, 1998–Sep 10, 1999</td>
<td>641 (40.9)</td>
<td>858 (54.7)</td>
<td>69 (4.4)</td>
<td>1,568</td>
</tr>
<tr>
<td>Sep 11, 1999–Sep 10, 2000</td>
<td>106 (22.4)</td>
<td>319 (67.4)</td>
<td>48 (10.2)</td>
<td>473</td>
</tr>
<tr>
<td>Sep 11, 2000–Sep 10, 2001</td>
<td>202 (45.8)</td>
<td>219 (49.7)</td>
<td>20 (4.5)</td>
<td>441</td>
</tr>
<tr>
<td>Sep 11, 2001–Sep 10, 2002</td>
<td>253 (53.2)</td>
<td>164 (34.5)</td>
<td>59 (12.4)</td>
<td>476</td>
</tr>
<tr>
<td>Sep 11, 2002–Sep 10, 2003</td>
<td>482 (73.4)</td>
<td>147 (22.4)</td>
<td>28 (4.3)</td>
<td>657</td>
</tr>
<tr>
<td>Total: Sep 11, 1998–Sep 10, 2003</td>
<td>1,684 (46.6)</td>
<td>1,707 (47.2)</td>
<td>224 (6.2)</td>
<td>3,615</td>
</tr>
</tbody>
</table>

### References


After the tsunami. Refugees camp in tents, 2 to 3 families have to live in one tent. Note the plastic water tanks with chlorinated water. Submitted by Eli Schwartz, MD.