



# Severe and benign *Plasmodium vivax* malaria in Emberá (Amerindian) children and adolescents from an endemic municipality in Western Colombia



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## KEYWORDS

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**Summary** Malaria in children is still an important public health problem in endemic areas of South-East Asia and Latin America. Certain forms of the disease, such as *Plasmodium vivax* severe malaria, are still neglected. This descriptive study assessed the frequency of severe and benign *P. vivax* infection in Emberá children (<14 years of age) from an endemic municipality in Colombia in 2013, using the WHO criteria. During 2013, 270 Emberá children presented 349 episodes of malaria. From them, 22 (8.1%) presented at least one of the criteria for severe malaria. Some patients with *P. vivax* presented with severe malaria (severe anemia, renal dysfunction,

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respiratory distress and seizure). Mixed malaria cases presented more complications than those with mono-infection (OR = 5.535; 95%CI 1.81–16.9). In Colombia, few data are available about severe *P. vivax* malaria in children, especially in the Amerindian ethnic groups. Mixed infections were associated with increased risk of severe malaria. At the same time, detailed and prospective studies are needed to measure the real impact of severe vivax malaria, as was evidenced in this paper.

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## Introduction

Despite significant reductions made during the last decade in the incidence of malaria in different regions of the world, this parasitic disease is estimated to kill 660,000–1,240,000 people annually, with children under five years of age representing >85% of malaria-related deaths [1–4]. In the specific case of the Americas, over the past decade, the number of confirmed malaria cases reported in the region decreased by almost 58%, from 1.1 million in 2000 to 469,000 in 2012 [1–3]. The reduction in children under five years of age was 48% [1–3]. The malaria mortality is projected to decrease by 52% in all of the age groups and by 60% in children younger than 5 years of age by 2015 [1–4]. This reduction represents substantial progress toward the World Health Assembly's target of reducing the malarial burden by 75% by 2015 [1–4].

This change in pattern in the Americas was observed in all of the endemic countries, with the exception of Venezuela, Haiti and Guyana [1,2]. In Venezuela, which is a country with a Human Development Index (HDI) of 0.748 and gross national income per head of US\$11,475, the malaria incidence increased between 2000 and 2012. A similar increase in incidence was observed in Guyana and Haiti, but both of these countries have a much lower HDI than Venezuela, and a devastating earthquake hit Haiti during that period [2].

In Colombia, although there has been a significant reduction also, specifically, from 125,262 cases in 2007 to 60,179 in 2012 [1,5,6], there are many endemic areas that have high annual parasitic indexes (API) (>50 cases/1000 pop.) [7], especially in the western pacific coast area, where there are 32 departments of the country; Chocó has the highest number of cases and incidences [5,6]. In Colombia, approximately 12 million people are estimated to be at some risk for malaria. *Plasmodium falciparum* is responsible for <20% of the malaria cases overall, although the proportion is higher in some departments of the country [1,5,6].

Departments in Colombia are grouped by regions, and one of them, which is located in the Andean area, is the Coffee-Triangle. This area is a topographical region that includes three departments (Caldas, Quindío and Risaralda) with 53 municipalities and a total population of 2,484,345 for the year 2013. In this region, one of the municipalities, Pueblo Rico (Fig. 1), reported 43.7% of the malaria cases between 2007 and 2011 (2877 of 6582), with 59.5 cases/1000 pop. in 2009 (the highest incidence in this 53-municipalities region) [7].

These less developed municipalities included urban areas above 1560 m.a.s.l. and rural below that altitude, with a population of 12,966 inhabitants in 2013 [8,9]. This population includes three ethnic groups: mestizo (54%), afro-colombians (14%) and Amerindians (Emberá) (32%); the last of which is considered to be a high biological and behavioral malaria-risk group in the area [7].

The urban area of this municipality has the only hospital in the area, Hospital San Rafael, which is responsible to attend to the population that lives in Pueblo Rico, including patients with malaria, who, as occurs in Colombia and other countries, are freely attended to from diagnostics to treatment, which is covered and funded by the government through the Malaria Control Programme [5].

Although it has epidemiological relevance, there is a lack of studies on malaria in the municipality (Pueblo Rico) as well as in the department where it is located (Risaralda) [7]. Thus, our research groups were interested on developing studies to understand malaria epidemiology in risk groups as well as clinical and therapeutics issues in this area. In this study, our aim is to assess the frequency of severe and benign infection due to *Plasmodium vivax*, the predominant etiological species in Pueblo Rico and Colombia, in Emberá children (under 15 years of age) from the Pueblo Rico municipality, Risaralda, Western Colombia (Fig. 1), during the year 2013.

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