High-risk tourism in areas vulnerable to schistosomiasis mansoni transmission in Brazil

Turismo de risco em áreas vulneráveis para a transmissão da esquistossomose mansônica no Brasil

Turismo de riesgos en zonas vulnerables para la transmisión de la esquistosomiasis en Brasil

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The tourism industry is one of the most important contemporary economic activities and the one with the highest growth rate in the world economy. According to the World Tourism Organization, the number of international trips has grown by 115.4% since 1995, and the forecast is for an additional 58.6% by 2030, when 57% of international arrivals will be at destinations located in emerging economies [1,2]. Brazil belongs to this scenario of expansion in the tourism industry due to the country's multiplicity of natural attractions, having received approximately 6 million international travelers in 2013, adding to the nearly 89 million arrivals of domestic flights [3].

This increase in the tourism industry has contributed to Brazil's economic and social development, with the appreciation of previously economically depressed places. However, in order to enjoy the environments and attract and accommodate visitors, natural landscapes have been modified, harming environmentally fragile areas [4]. These modifications, imposed on natural spaces and caused by the real estate speculation from tourism's dynamics, expose both the local population and visitors to the risk of acquiring diseases, including schistosomiasis mansoni [5,6,7,8,9,10].

Schistosomiasis mansoni is one of the most relevant endemic diseases in Brazil, with *Schistosoma mansoni* as the etiological agent and snails of genus *Biomphalaria* as intermediate hosts [11]. Transmission occurs in 19 of Brazil's states. An estimated 6 million persons are infected, and approximately 25 million individuals are exposed to the risk of acquiring the disease [12]. Due to its magnitude, measures to control schistosomiasis have been conducted in Brazil since 1975 through the Special Schistosomiasis Control Program (PECE), created and implemented by the Inspectorate for Public Health Campaigns (SUCAM), replaced by the Schistosomiasis Control Program (PCE) in the following decade. However, despite efforts, in recent decades the transmission area has expanded to previously unaffected urban and coastal locations, displaying a tendency to changes in the traditional epidemiological pattern of schistosomiasis [13,14].

Pernambuco State in Northeast Brazil experienced a growing exodus of individuals from rural areas, often parasitized by *S. mansoni*, to coastal tourist sites, attracted by the abundant supply of jobs in services. They began to live in unhealthy peripheral areas, contaminating the freshwater bodies naturally inhabited by snail vectors of schistosomiasis. During the rainy season breeding sites with infected snails overflow, leading to mass human infection. Scenarios like these have been described in 12 coastal municipalities (counties) in Pernambuco, including the Porto de Galinhas resort in Ipojuca [5,10,15].

Porto de Galinhas achieved high status on world tourist routes in the 1980s. In 2000, 15 schistosomiasis transmission foci were identified, with the first epidemic outbreak of acute

cases of the disease in this locality. Introduction of the disease in this resort began with the arrival of rural workers as labor in tourism projects, and the snails were introduced there with the water and sand taken from the Ipojuca River and used as construction materials. The mode of occupation and the modifications in that tourist resort, combined with the adverse climatic and sanitary conditions, were the factors responsible for maintenance of the disease, now considered endemic in Porto de Galinhas [5,15].

Various coastal tourist sites in Brazil harbor the intermediate hosts of schistosomiasis, and there are reports of transmission of the disease in various coastal destinations in the country [16,17,18].

The spread of this disease to coastal localities, although extensive, does not mean that transmission of the disease is any less important in rural endemic areas of Brazil with persistently high schistosomiasis prevalence rates, such areas still maintain the adverse sanitary conditions and sociocultural habits that facilitate the endemic. In recent years, given the growth of tourism in Brazil and the country's environmentally attractive destinations, rural tourism has become a new source of income for many families living in the countryside. The rural tourism industry has encouraged old and economically depreciated agricultural properties to diversify their activities by offering infrastructure for recreation, leisure, and lodging, meanwhile upgrading and revaluing their spaces. However, changes made to the natural environment to help attract tourism, together with the limited investment in sanitation, have produced unhealthy environments that can sustain schistosomiasis transmission, with frequent reports of acute cases in various rural tourist spots, where the flow of visitors and their interaction with structurally imbalanced environments favors spread of the disease across the country and around the world [6,7,8,9,19].

Travelers exposed to schistosomiasis infection develop the acute form of the disease, since they lack previous contact with the parasite *S. mansoni*. The acute infection is self-limiting, and travelers can return home without having detected the infection, thus delaying timely treatment and contributing to propagation of the disease in previously unaffected areas [9]. Tourists can thus become potential disseminators of schistosomiasis, since they move between endemic and non-endemic spaces.

Cases of transmission and spread of schistosomiasis by tourists have been identified in recent years in Europe, where 2014 witnessed the first report of a human case of autochthonous schistosomiasis since elimination of the disease in the 1960s. A 12-year-old German boy was diagnosed with *Schistosoma haematobium* five months after vacationing with his family in southeastern Corsica, France, where he had bathed in a river [20]. Ten more cases were later reported in the same locality [20,21]. There are also reports of the migration of patients with schistosomiasis haematobium on the island of Lampedusa, Italy [22]. It is further estimated that 2.5% of Spanish tourists may return to Spain infected with *Schistosoma*, given the significant number of trips to endemic areas [23]. These data show that schistosomiasis is far from being controlled at the local, national, or international level.

All of the above emphasizes the need to investigate the environmental conditions of tourist destinations in Brazil to identify potential health risks, reorganizing and sanitizing the spaces in order to prevent tourists from acquiring schistosomiasis and other vector-borne diseases. Health professionals in tourist locations should be alert to the diagnosis and treatment of local patients, and be aware of the vulnerability to the acute clinical form to which non-immune tourists are exposed. Finally, it is essential to address tourists' health through a set of measures with an intersector scope, especially between health surveillance and tourism departments, in a joint effort for the maintenance of healthy tourist environments, valuing Brazil's natural areas and avoiding the exposure of tourists to the risk of acquiring schistosomiasis.

Contributors

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