

Once malaria is eliminated, more attention should be paid to imported malaria: Data from five years of surveillance in the City of Yiwu in eastern China

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Summary

This study reviewed and analyzed data on malaria cases in Yiwu from 2012 to 2016 via a web-based system for managing and reporting information on infectious diseases. A total of 161 cases were diagnosed (77.02% due to *Plasmodium falciparum*, 18.01% due to *P. vivax*, 4.35% due to *P. ovale*, and 0.62% due to *P. malariae*). One case was imported from Yunnan Province in China and the others were imported from overseas. The ratio of male to female patients was 7.47:1. The average age was 36.34 years (SD: 9.63). Most cases (87.58%) were imported from 1 of 30 countries in Africa. As malaria is gradually being eliminated in China, the main task at this stage has transitioned to the prevention and control of cases of imported malaria. Particular attention should be paid to malaria cases from Africa.

Keywords: Malaria, imported, China

1. Introduction

Malaria is a debilitating parasitic disease. According to the Roll Back Malaria (RBM) Partnership, each year approximately 860,000 people (89% in the African region, followed by 6% in the Eastern Mediterranean region, and 5% in the South-East Asia region), mainly children and women, succumb to the disease. Despite successful elimination programs, a resurgence of malaria has occurred in Eastern Europe, Jamaica, the Bahamas (1,2), and the Korean peninsula (3,4). The City of Yiwu had been an area of China with a high rate of malaria transmission, with a morbidity of 2,830/10,000 in 1957. Due to large-scale surveys and anti-malaria campaigns, the incidence of malaria dropped sharply below 1/10,000 after 1977, and the last autochthonous case was reported in June 2008. With the growth of international trade and travel, migrants have accounted for most cases

of imported malaria in Yiwu. Given the high rate of transmission and the susceptibility of the population, effective strategies are required to prevent re-introduction and re-establishment of the disease in Yiwu.

The current study reviewed and analyzed data on malaria cases in Yiwu from 2012 to 2016 via a web-based system for managing and reporting information on infectious diseases. Cases must be differentiated into autochthonous and imported cases in line with the "1-3-7" strategy (which refers to reporting suspected cases of malaria within 1 day, investigating and confirming the diagnosis within 3 days, and investigating the focus and responding to prevent further transmission within 7 days) launched in 2012 (5). Clinically diagnosed cases, laboratory confirmed cases, autochthonous cases, and imported cases were all included in this study. Population data were obtained from the Bureau of Statistics of Yiwu. Spatial cluster analysis was performed to test whether the malaria cases were randomly distributed spatially; if not, any identified spatial clusters of disease were examined for statistical significance. Statistics were described using the software Excel version 2010.

From 2012 to 2016, a total of 161 cases of malaria were reported in Yiwu, and the annual average incidence was 13.05/10,000 during this time. There were 22 cases in 2012, 34 in 2013, 29 in 2014, 30 in 2015, and 46 in

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2016. As a result of proper treatment, no deaths occurred. The ratio of male to female patients was 7.47:1, and the average age was 36.34 ± 9.63 years. All of the cases were imported from abroad, except for one imported from Yunnan Province. More than half of the patients were foreigners (55.90%). Most patients were in the service industry (83.85%) or migrant workers (11.18%) and lived on Choucheng Street (55.76%) or Jiangdong Street (24.22%) (Table 1). More than three quarters (77.02%) of the cases were due to *P. falciparum*, 29 cases (18.01%) were due to *P. vivax*, 7 cases (4.35%) were due to *P. ovale*, and 1 case (0.62%) was due to *P. malariae* (Table 2). Five cases of *P. vivax* and 1 case of *P. ovale* recurred. Twenty-five cases (15.53%) were imported in August. The seasonal distribution of cases did not differ significantly throughout the year. Most cases (87.58%) were imported from 1 of 30 countries in Africa, and the three leading countries were Ghana, Nigeria, and Angola. Sixteen cases were from South Asia, and 10 of those were from India (Table 3). The time interval from onset to diagnosis was 0-47 days, with a median of 3 days. Most cases (79.5%) were diagnosed 5 days after

onset. One hundred and fourteen cases of malaria were diagnosed at primary care facilities. Eighty-one patients had previously had malaria.

This study revealed substantial changes in the epidemiological characteristics of malaria reported in Yiwu from 2012 to 2016. Yiwu faces an increasing incidence of malaria imported by migrants returning from Africa and South Asia, and an epidemic may occur if no efforts are made to prevent these outbreaks. The international flow of people has led to a large number of cases of imported malaria. The "1-3-7" strategy for elimination of malaria should be followed and all of the indicators and timeframes must be observed to promptly diagnosis and treat the increasing number of cases of imported malaria in Yiwu. Potential reservoirs must be eliminated and outbreaks due to imported pathogens must be prevented. The government should continue to emphasize the elimination of malaria and ensure efforts are funded. Effective mechanisms of multisectoral cooperation and coordination should be enhanced. Capacity should also be improved with a focus on surveillance, urgent responses, diagnosis, and treatment. Moreover, studies by and cooperation among universities, research institutes, and government agencies should be fostered and enhanced as malaria is being eliminated.

Table 1. Characteristics of patients with imported malaria in Yiwu from

Characteristics	Cases	Proportion (%)
Gender		
Male	142	88.20
Female	19	11.80
Nationality		
Chinese	71	44.10
Foreigner	90	55.90
Occupation		
Service industry	135	83.85
Migrant worker	18	11.18
Other	8	4.97
Present address		
Choucheng Street	93	57.76
Jiangdong Street	39	24.22
Beiyuan Street	7	4.35
Other	22	13.67
Total	161	100.00

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Table 2. Classification of imported malaria in Yiwu from 2012-2016

Type	2012	2013	2014	2015	2016	Total	Proportion (%)
<i>P. falciparum</i>	17	21	21	25	40	124	77.02
<i>Plasmodium vivax</i>	5	11	6	3	4	29	18.01
<i>P. ovale</i>	0	2	1	2	2	7	4.35
<i>P. malariae</i>	0	0	1	0	0	1	0.62
Total	22	34	29	30	46	161	100

Table 3. Origin of imported malaria in Yiwu from 2012-2016

Type	Africa	South Asia	Southeast Asia	Oceania	China	Total
<i>P. falciparum</i>	123	0	0	0	1	124
<i>P. vivax</i>	10	16	2	1	0	29
<i>P. ovale</i>	7	0	0	0	0	7
<i>P. malariae</i>	1	0	0	0	0	1
Total	141	16	2	1	1	161
Proportion (%)	87.58	9.94	1.24	0.62	0.62	100

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