

# Malaria Epidemics in Refugees During Armed Conflict

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## Abstract

Refugees displaced from their usual residence by military conflict may generate malaria epidemics when moving into endemic areas. Examples from the 1980s include Khmer refugees from Cambodia into Thailand and Afghan refugees from Afghanistan into Pakistan. In both cases, civilians with little malaria experience were exposed to both *P. vivax* and *P. falciparum* malaria. After military coups, Burmese refugees from Myanmar to Thailand also experienced malaria epidemics when coming from non-endemic areas. When Papuan refugees from Indonesia fled into Papua New Guinea, little malaria resulted as there was malaria on both sides of the international border. However, later transmigrants from Java to Papua experienced lethal malaria epidemics. Previous immunity, access to medical care and ecological disruption promoting mosquito vectors all contribute to a composite malaria epidemic risk. Those conducting humanitarian assistance missions need to be alert to the possibility of malaria outbreaks in refugee populations.

**Keywords:** malaria, epidemic, infectious diseases, Indo-Pacific, refugees

*...severely depleted by malaria and other sickness. A few refugees - the lucky ones, the most knowing, those who still had money to buy and bribe their way out - were able to get to Imphal.<sup>1</sup>*

One of the horsemen of the Apocalypse following in the wake of war is disease, and often in the tropics, that disease is malaria. Civilian refugees displaced by the fighting flee into the jungle, where they are exposed to various vector-borne diseases, with malaria having the greatest lethal potential. Tens of thousands perished from malaria as ethnic Indians fled the Imperial Japanese Army invasion of Burma in 1942. Most of the British Army retreated into India before the monsoon trapped the refugees in highly malarious valleys as described in the opening quote.<sup>1, 2</sup> Even civilians left largely undisturbed in their homes suffered from malaria epidemics when war disrupted established patterns of drug treatment, as during the German invasion of Greece in 1941 and the Japanese occupation of Malaya in 1942–43.<sup>3, 4</sup>

Epidemics, by definition, occur suddenly and often unexpectedly when civilians without previous malaria exposure are displaced into endemic areas. Therefore, humanitarian assistance and disaster relief (HADR) efforts must expect malaria epidemics even when assisting civilians in areas that previously had relatively low malaria transmission but have subsequently been disrupted by armed conflict. Four examples (Thailand, Pakistan, Myanmar, New

Guinea) of refugee malaria epidemics from the latter 20th century are briefly examined to remind current medical workers of the complexity of managing public health during complex humanitarian emergencies.

Following the 1979 Vietnamese invasion of Cambodia, more than 500 000 Khmer refugees fled west towards Thailand, many of whom had been forcibly removed from Cambodia's central rice-growing areas by the Khmer Rouge seeking to maintain their support base.<sup>5</sup> Many of the 30 000 plus who arrived in Thai refugee camps were non-immunes, infected with malaria during their trek through the jungle. Some camps (e.g. Khao-I-Dang) were largely populated by those taking a northern route that avoided most transmission areas and thus had much less malaria. However, in other camps, malaria was the leading cause of death.<sup>5</sup> It is uncertain how many refugees failed to arrive at the Thai border areas because of acute attacks of malaria and lack of medications, which stopped their journey prematurely. High rates of positive malaria blood smears in other camps noted gametocytes indicating infections of some weeks' duration. Mass drug treatment with single dose sulfadoxine/pyrimethamine (SP) may have rapidly decreased initial mortality rates but soon disclosed falciparum malaria drug resistance.<sup>5, 6</sup> Multiple drug-resistant falciparum malaria became a major public health problem in the refugee camps, which was only partially solved by the subsequent introduction of mefloquine combinations.<sup>7</sup> As the acute crisis transitioned into a long-term displacement, medical care systems improved and deforestation limited

transmission in the immediate camp areas. However, malaria remained an ongoing problem until most camps were dissolved following the end of the Khmer Rouge or refugees were resettled in third countries.

Large numbers of Afghans were displaced from their homelands in non-endemic mountainous areas into the Pakistan border region by the Soviet invasion of 1979. Over 2 million people in more than 200 camps were involved mainly in Pakistan's western borderlands of around Peshawar. Epidemic malaria of over 100 000 cases annually resulted from midyear transmission from marginal land used for camps that were often near irrigated fields supporting mosquito vectors. The majority of cases were due to *P. vivax* producing relapsing malaria and fewer problems with either SP or chloroquine drug resistance than in Thailand.<sup>8</sup> Over time, treatment protocols have shifted to artemisinin combination therapy, but it remains challenging to deliver 8-aminoquinolines such as primaquine to stop further *vivax* relapses. Following the stabilisation of the refugee camps over decades into large informal cities, traditional means of vector control such as residual insecticide spraying of walls, insecticide impregnation of tents/bed nets and some less traditional forms such as sponging cattle with insecticide as a means to kill Anopheline vectors were instituted.<sup>8, 9</sup> There have been reports of blaming Afghan refugees for increasing malaria infections in the host country. However, evidence following the repatriation of many refugees after the Soviet exit from Afghanistan indicates that malaria statistics reflect the health system collecting more data rather than an actual change in epidemiology.<sup>10</sup>

Thailand also experienced malaria epidemics involving refugees on its western border with Burma (now Myanmar) from the 1980s.<sup>8</sup> Some of this developed from generations-long conflict between the Burmese Army and various ethnic minority/tribal armed groups but was exacerbated when political unrest driven by military takeovers in the centre of the country (1988, 2021) led to large influxes of Burmese refugees.<sup>11</sup> Therefore, on a background of ongoing armed conflict across a rugged jungle terrain with ongoing malaria transmission, there have been civilian populations displaced locally across the Thailand border by the Burmese Army as well as intervals with many urban civilians fleeing from Myanmar's centre out to camps on the Thai border. Malaria transmission has generally been low (1–2 infections per person per year) but has fallen over time due to improved medical care and deforestation limiting Anopheline vectors.<sup>11</sup> Most refugees in Southeast Asia now encounter malaria only rarely outside of an acute epidemic. Antimalarial drug resistance has been a key feature in the camps

along the Thai border, where the failure of first SP and then mefloquine + SP led to pioneering work with various artemisinin combinations leading to the usual current choice of artesunate + mefloquine.<sup>8</sup> Public health measures such as a network of village volunteers to diagnose and treat malaria have necessarily included both the Thai civilian and Myanmar refugee populations with good success coming from greatly improving access to known curative treatments.<sup>12</sup> Over decades, many of the refugee camps have become established villages, and malaria varies not only seasonally with the rains but also with the extent of human displacements triggered by armed conflict (see Figure 1).



*Figure 1: Long-established refugee camp (Sho Klo) constructed from local materials on the Thai-Myanmar border, circa 1990. Photo by the author.*

When 12 000 ethnic Papuan civilians from the Indonesian province of what was then called Irian Jaya (now West Papua) fled east in 1984 into the neighbouring country of Papua New Guinea (PNG), epidemic malaria was not a major problem.<sup>13</sup> This was primarily due to the Melanesian populations involved being from similar tribal groups that had long lived in malarious areas on the other side of an international border. Integration into the PNG populace was widespread and allowed the local government to handle these refugees as visitors/guests initially.<sup>14</sup> However, malaria became a significant problem in Indonesian civilians (mainly from Java and Sumatra) who were being 'transmigrated' into West Papua under circumstances that suggested they were being used to displace the original Melanesian communities. Transmigrants, not usually malaria-experienced, proceeded to set up villages and rice farming under government support in clearings cut out of the jungle (see Figure 2). Malaria epidemics, including many severe cases and deaths, ensued, suggesting that the key factors were lack of malaria immunity and disruption of the local ecology.<sup>15</sup> Extensive malaria studies were done within the transmigrant groups showing that initial malaria

mortality rates, especially in adults, moderated over time.<sup>17</sup>



*Figure 2: Indonesian transmigrant camp in Irian Jaya (now West Papua) in the Arso region bordering Papua New Guinea in 1993. Photo by the author.*

Armed conflicts in the tropics often involve malaria, where the epidemiology can radically change when wartime exigencies rearrange populations. The risk factors that promote malaria epidemics in refugees include forcible translocation into endemic areas, ecological disturbances promoting Anopheline vectors, lack of previous infection, poor medical access and antimalarial drug resistance. East Timor was not highly malarious in 1999 when disputes over an election escalated into armed conflict and mass civilian displacements. However, malaria exploited the intersection of human, vector and parasite populations driven together by armed conflict. The resulting malaria epidemic has taken 20 years to eliminate within the civilians of East Timor. The ADF experienced its greatest malaria event in East Timor since the Vietnam War, which initially required re-learning the old lessons of enforced daily chemoprophylaxis and post-exposure radical cure to eliminate relapsing malaria.<sup>18</sup> The potential for future HADR missions involving malaria in refugees exists regionally in the Melanesian, Indonesian and Philippines archipelagos; anywhere with any degree of endemic malaria transmission has the potential

for epidemics. The ADF is better prepared now that long-acting weekly chemoprophylaxis is available following the Therapeutic Goods Administration 2018 registration of tafenoquine.<sup>19</sup> Although no chemoprophylaxis is perfect, tafenoquine is a well-tolerated medication that is much easier to supervise compliance on a weekly schedule and covers post-deployment vivax relapses without additional medication. Historical examples of refugee malaria epidemics indicate the ADF will likely need both tafenoquine and its institutional experience with malaria in the future.

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