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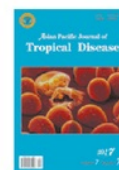
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## A new endemic area of ovale malaria in Indonesia: A case report from Sumatra Utara Province

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## ABSTRACT

Ovale malaria cases in Indonesia have been reported only in the provinces of Papua, East Timor and West Flores. We have found a case of *Plasmodium ovale* infection in Langkat District, North Sumatra Province. Diagnosis was based on a complaint of recurrent fever accompanied by chills and intermittent fever and confirmed by Giemsa-stained microscopic examination of thick and thin peripheral blood smears. The characteristic morphology of *Plasmodium ovale* in blood smear determined the patient's diagnosis. Thus, a new endemic areas of ovale malaria was discovered in Indonesia.

## 1. Introduction

The World Health Organization has reported that 3.3 billion of the world population are at risk of malaria and annually more than 200 million clinical malaria cases are diagnosed with approximately 660 000 deaths, and 90% cases of young children are in Sub-Saharan Africa[1]. Therefore, the malaria is the most prevalent and deadly parasitic disease. *Plasmodium falciparum* (*P. falciparum*) is associated with the most severe form among five species plasmodium that cause of malaria in humans[2].

*Plasmodium ovale* (*P. ovale*) described by Stephen in 1922 was found mostly in Sub-Saharan Africa and the Western Pacific islands with a prevalence of 3%–10% depending on the diagnostic tests used, region and local population[3]. The new endemic areas have been reported from Asia, such as Indonesia, India, Laos, Myanmar, Thailand, Vietnam and Cambodia[4,5]. Baird *et al.* reported 34 cases of *P. ovale* infections from 15.806 peripheral blood smear in Owi Island, Papua and East Timor from 1973 to 1989. *P. ovale* infections were also reported in West Flores. However, there is at present no reported cases of *P. ovale* infection from Sumatra, Borneo, Java and Sulawesi islands[6]. In Latin America there is no autochthonous cases of *P. ovale*

and only a few cases of imported *P. ovale* infections were reported. Sutherland *et al.* reported two non-recombining sympatric species of *P. ovale*, namely *P. ovale curtisi* (classic type) and *P. ovale wallikeri* (variant type)[7]. Moreover, Alemu *et al.* showed the *P. ovale* infection with sympatric distribution of indigenous *P. ovale wallikeri* and *P. ovale curtisi* in Northwest Ethiopia[8]. We report, to our knowledge, the first indigenous case of *P. ovale* infection in Sumatra Utara Province, Sumatra, Indonesia.

## 2. Case report

An Indonesian female patient, 38 years old, Karo tribe, farmer and living in Gerunggang village, Kuala Subdistrict, Langkat District, Sumatra Utara Province has been discovered by the team of tropical and infectious diseases clinic on a survey in that area. Her complaints were recurrent fever with chills during the period of more than one month. No history of travel outside of her residence. Vital signs were good except axillary temperature of 38 °C. However, she still could carry out her work normally.

Physical examination revealed an enlarged spleen (splenomegaly). Three peripheral blood samples had been taken for microscopic examination and the results of rapid diagnostic test were positive for *P. falciparum*. The patient was treated with an antimalarial combination of piperazine plus dihydroartemisinin, three tablets in a single dose for 3 days. On first microscopic examination of thick blood, we detected a mixed infection of *P. falciparum* and *Plasmodium vivax* (*P. vivax*) forms with parasite density 7880/μL and 1040/μL of blood,

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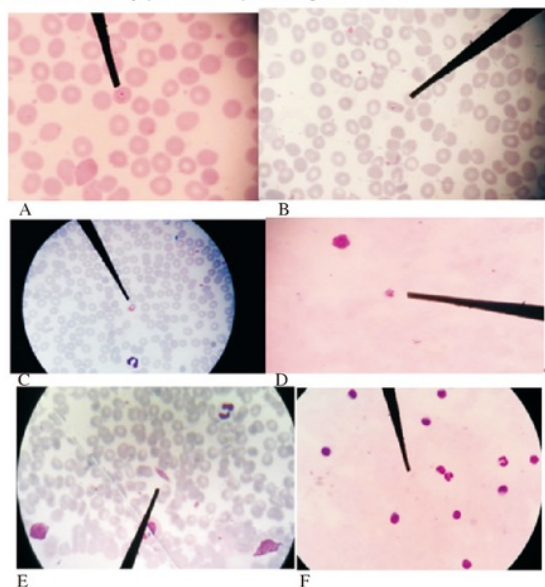
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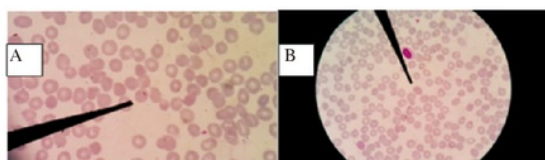
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respectively. On microscopic examination of thin blood smear, we found trophozoite forms of *P. falciparum*. On further observation, a trophozoite form had been found with the nucleus in the middle of the cytoplasm that was not common for *P. falciparum* (Figure 1A) and a schizont form that is extremely rare in peripheral blood in *P. falciparum* infection. Therefore, subsequent observations were performed on the other blood smear slides which showed a trophozoite form of *P. ovale* that was typical with an oval shaped and enlarged erythrocytes with fimbriated edges (Figure 1B) and mature trophozoites of *P. ovale* (Figure 1C). The appearance of schizonts in thin smear was *P. ovale* (Figure D). The sexual forms or microgametocyte were also detected (Figure 1E). Therefore, the results of prior microscopic examinations of the thick blood smear were a mixed infections of *P. falciparum* and *P. ovale* with a parasite density of *P. ovale* 1040/μL of blood (Figure 1F). Trophozoite form of *P. falciparum* had been detected in thin smear (Figure 2). These results of microscopic examinations were confirmed by a parasitologist at the Department of Parasitology, Faculty of Medicine, Brawijaya University, Malang, Indonesia.



**Figure 1.** Microscopic thick and thin smear slides with Giemsa-stained. A: Trophozoite *P. ovale* with central nuclei in thin smear; B: Trophozoite *P. ovale* with fimbriate in thin smear; C: Mature trophozoite *P. ovale* in thin smear; D: Schizont *P. ovale* in thick smear; E: Microgametocyte *P. ovale* in thin smear; F: Suspected *P. falciparum* and *P. ovale* in thick smear.



**Figure 2.** Trophozoite *P. falciparum* (A and B) in thin smear.

### 3. Discussion

The geographic distribution of ovale malaria was primarily reported from Africa, Middle East, and Papua New Guinea. It was rarely reported from Southeast Asia countries. In Indonesia, only Papua and West Flores were reported as endemic areas. However, the use of polymerase chain reaction based species identification and improved microscopic techniques has made *P. ovale* infections reported more frequently in Southeast Asia. *P. ovale* and *P. vivax* can lead to relapsing tertian malaria with their life cycle in the liver (dormant stage) after

primary infections have been cured[9,10]. Therefore, appropriate treatment based on accurate diagnosis of *P. ovale* infection is crucial for preventing ovale malaria in travellers[5].

The typical clinical symptoms such as fever, preceded chills every two days in *P. ovale* and *P. vivax* infections are indistinguishable. Microscopic thick blood examination is also difficult to differentiate between the two plasmodium species[4].

We were able to detect the trophozoite and schizont forms in thin smear with enlarged infected erythrocyte with fimbriated edges and central nuclei indicating the characteristic morphology of *P. ovale* infection. The enlarged red blood cells can be oval or round shaped and can be found James's dots in the erythrocyte cytoplasm. Ten comet form and compact parasite cytoplasm. Mature schizonts of *P. ovale* are indistinguishable from those of *Plasmodium malariae*.

This patient had no history of travelling out of her residence, which makes it a possible of indigenous case through a mosquito bite. This incidental finding of *P. ovale* infection indicates a new endemic in Sumatra Utara Province and highlights the need for rigorously monitor of malaria incidence.

One case of ovale malaria had been discovered in Langkat District, Sumatra Utara Province, which increased the endemic area besides those reported in Papua and Flores Provinces in Indonesia. The characteristic morphology of *P. ovale* in infected erythrocytes confirmed the diagnosis of ovale malaria.

### 4 Conflict of interest statement

We declare that we have no conflict of interest.

### Acknowledgements

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