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Plasmodium Knowlesi Malaria

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Abstract
Plasmodium knowlesi is a zoonotic Malaria parasite. It is now becoming very important. The vector is anopheles mosquito of different species. Many cases have also been found in offshore island areas of India. It is clinically similar to Falciparum malaria.

Keywords: plasmodium; malaria; diagnosis

Introduction

Plasmodium knowlesi can cause malaria in man and is now regarded as the fifth *Plasmodium* species infecting man. It can spread from man to man. The first natural infection of *P. knowlesi* in humans was reported in 1965 in an American traveller who returned from Malaysia. Cluster of cases was first seen as human malaria cases from Borneo and Sarawak in Malaysia in 2004. Initially it was isolated, however, from simian malaria cases. Cases have been very common in travellers returning from Malaysia. In fact, from 2004 to 2015, out of all the cases of *P.knowlesi* malaria, 91.47% were seen in Borneo in Malaysia alone [1].

History

This species of Plasmodium was first described in 1932 by Knowles and Dasgupta [2]. The natural reservoir host of the parasite are the long-tailed macaque (*Macaca fascicularis*), pig-tailed macaque (*Macaca nemestrina*) and the banded-leaf monkey (*Presbytis melalophos*)(1). Mosquitoes of the Leucosphyrus group have been put forward as vectors for knowlesi malaria, namely *Anopheles hackeri*, *Anopheles latens*, *Anopheles cracens*, *Anopheles balabacensis*, *Anopheles dirus* and *Anopheles introlatus* [1]. *Anopheles hackeri* is a predominantly zoophilic mosquito species and the first discovered vector for Knowlesi malaria. *Anopheles balabacensis* can cause spread of Knowlesi malaria from man to man, man to monkey and monkey to man. *A. latens* is the commonest vector transmitting Knowlesi malaria in Kapit area, Sarawak.

Epidemiology: Almost all the cases are seen in few provinces of Malaysia due to the distribution of the natural host and vector in these areas only. Till now, most cases have been described in the states of Sarawak and Sabah (in Malaysian Borneo) and also in the Pahang region (in peninsular Malaysia) [3]. However, cases are seen occasionally outside these areas. For example, cases have been seen in Thailand, the Philippines, and Singapore also [4]. In Kapit region in Sarawak, Malaysia, 87% of long tailed macaques and 50% of pig-tailed macaques were found to be positive for *P. knowlesi* [5]. In India, some of the genetic sequences of malaria cases in Andaman and Nicobar Islands have shown sequences of *Plasmodium knowlesi*.

Age and gender predilection: The cases of *Plasmodium knowlesi* infection are seen more in persons aged more than 15 years. Also, infection is mostly encountered in male subjects than females.
Zoonotic Malaria: *Plasmodium knowlesi* and *P. cynomolgi* can cause zoonotic malaria.
Clinical features: Knowlesi malaria follows a course similar to Falciparum malaria, with same cytoadherence pattern and ability to invade all stages of RBCs. Fever and tachypnoea are commonest findings. Knowlesi malaria causes severe disease in up

to 10% of cases with a case fatality rate of 3% in the Malaysian peninsula [3].

Results

Laboratory Diagnosis: Microscopy may fail to diagnose Knowlesi malaria, because here there may be fever with very low parasitemia. RDT/Rapid diagnostic tests or rapid antigen tests may mistakenly identify it as PM vivax or *P. falciparum*, because *P. knowlesi* possesses both HRP- 2 and LDH antigens [1]. However, antibodies of different classes can be used in these rapid test platforms to detect *P. knowlesi* antigens in blood. It is now known that, *P. knowlesi* does not react with 10D12 (an antibody that is specific for *P. ovale*), 7E7 (an antibody that reacts strongly with *P. malariae* and weakly with P. falciparum), or 9C1 (an antibody that reacts exclusively with *P. ovale* and *P. malariae*) [4]. These are important for diagnosis. The morphological features of the early trophozoites of *P. knowlesi* are almost similar to those of *P. falciparum*, with double chromatin dots, multiple trophozoites in one RBC, and no enlargement of infected RBCs [5]. Among blood parameters, thrombocytopenia is almost always found in Knowlesi malaria. However, unlike Falciparum malaria, severe anemia is not a commonly reported feature at the time of presentation for adults with knowlesi malaria [5].

Nested and real-time PCR targeting the 18S rRNA gene can detect *P. knowlesi* in a level as low as 1 parasite/μL of blood [6].

Treatment: Chloiroquine alone may be sufficient to kill P. knowlesi. In nonhuman primate studies, Tetracycline, clindamycin, trimethoprim, erythromycin, and artemisinins have all been shown to possess antiparasitic effect on P. knowlesi . They can all be usefukl for treatment.

Discussion

One should hence be vigilant about *P.knowlesi* and suspect it whenever a case of encounter with primates has been observed in hyperendemic zones. Normal cases of man-to-man sopread of Knowlesi malaria is also possible.Proper suspicion will help in timely diagnosis and treatment.

Conclusion

Plasmodium knowlesi is an important agent of not only zoonotic but also other cases of malaria also. One should be vigilant about Knopwlesi malaria in order to manage it well.

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