

Case Report

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Dengue and Malaria Coinfection in An Overweight Child

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Abstract

Background: Dengue and malaria are infectious diseases transmitted by mosquitos mainly in tropical countries, including Indonesia, but there are only a few cases where both diseases are endemic in the same region. Malaria is difficult to diagnose in a dengue-endemic area due to the similar clinical symptoms. As a result, it can be misdiagnosed and affect treatment, resulting in a negative outcome. **Case Presentation:** This study presented a case of dengue and malaria coinfection in a 14-year-old overweight boy who was admitted to the hospital with fever, shivers, and a severe headache. Microscopic examination showed several form of *Plasmodium falciparum*'s trophozoite ring (Fig 1). Laboratories test showed a low thrombocyte level, 79.000/ μ L, hematocrit of 43.8%, serologic anti-dengue IgM was negative, and anti-dengue IgG was positive. Dengue therapy was administered in accordance with the World Health Organization's Dengue Diagnosis Guidelines, as well as the antimalarial drugs dihydroartemisinin-piperazine and primaquine. There was no bleeding or shock during the five days of treatment, and no severe malaria complications were discovered. The patient was discharged with an improved general condition and normal hematological results. **Conclusion:** This paper aimed to emphasize the significance of early detection and appropriate management of dengue and malaria co-infection in dengue endemic areas in order to achieve a positive outcome and prevent complications.

Keywords: Dengue, Malaria, Coinfection.

INTRODUCTION

Dengue and malaria are infectious diseases transmitted by mosquitos. The mosquito vectors that transmit the dengue virus are *Aedes aegypti* and *Aedes albopictus*, while *Anopheles* mosquitoes transmit plasmodium malaria. The morbidity and mortality are high in the tropical and sub-tropical countries where malaria and dengue are endemic. In countries where both dengue and malaria are endemic, the simultaneous occurrence of malaria infection and dengue hemorrhagic fever may occur in one individual, although this is not common [1,2].

Both dengue and malaria can cause acute febrile illness, and their similar clinical features making it difficult to distinguish them early in the disease's course. Misinterpretation in diagnosing dengue infection as malaria or vice versa can occur. Delays in diagnosing dengue result in delays in fluid management, which is critical in preventing severe dengue, which can result in death. Delays in malaria therapy will also result in poor outcomes [3].

Patients with overweight or obesity are at risk of developing severe disease when infected to dengue or malaria. The relation between childhood obesity and severe dengue has received a lot of attention [4], but the prevalence of obesity with severe *Plasmodium falciparum* malaria more commonly found in adult patents [5]. Tangpukdee *et.al.*, [6] proved that overweight could be a risk factor of severe malaria in patients aged ≥ 15 years with *Plasmodium falciparum* malaria without complication. There have been no reports of overweight children with *Plasmodium falciparum* malaria infection so far.

Data from Ministry of Health of Republic of Indonesia in 2020 has identified 13 provinces with the highest dengue infection including South Sulawesi [7]. Meanwhile, the high malaria endemic concentrated in the Eastern Indonesia, such as Papua, West Papua, and East Nusa Tenggara [8]. Although South Sulawesi, particularly Makassar, is not malaria-endemic, the identified cases were mostly imported cases from another malaria-endemic provinces.

The nutritional status of the patient based on the Body Mass Index (BMI) assessment, which came from the comparison of body weight and body height, was 25.24 kg/m² (above the 90 percentile) which means overweight (Fig 2).

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Based on those supporting tests, it was concluded that the child has dengue and *Plasmodium falciparum* malaria coinfection, and also overweight.

The patient received dihydroartemisinin-piperazine (DHP) for 3 days and continued with primaquine for 1 day only. Due to dengue warning signs such as abdominal tenderness, hematocrit increase, thrombocytopenia, and positive rumple leede, the treatment was given based on the WHO Guidelines for Dengue Diagnosis 2009, which is group B treatment. The treatments were including isotonic Ringer Lactate administration until the 4th day of hospitalization, close control of hemoconcentration and thrombocytopenia every day.

The patient's clinicals improved after receiving malaria medication. Headache and photophobia were gradually subsided. There was no malaria complication such as cerebral malaria, hyperpyrexia, severe anemia, and seizure on this patient. Subfebrile fever was still presence until the third day of treatment or 6 days of disease course, which was possibly due to malaria coinfection, so the fever phase was longer. There was no epistaxis, other sign of bleeding, or shock symptoms during critical phase, amidst the lowest thrombocyte level reaching 23.000/ μ L. The thrombocyte level increased and returned to normal on the fifth day of treatment. Although the hematocrit increased, the concentration did not reach 20%. The patient was discharged after 5 days of treatment.

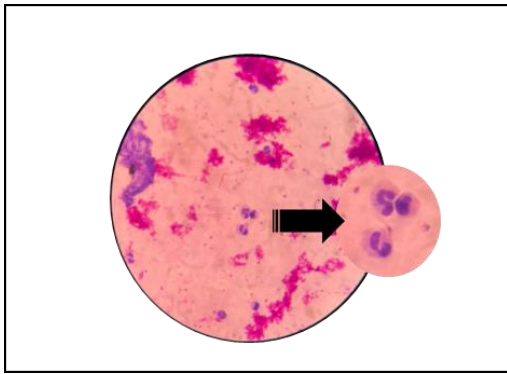


Figure 1: Malaria microscopic examination showed trophozoite (ring shaped) *Plasmodium falciparum*

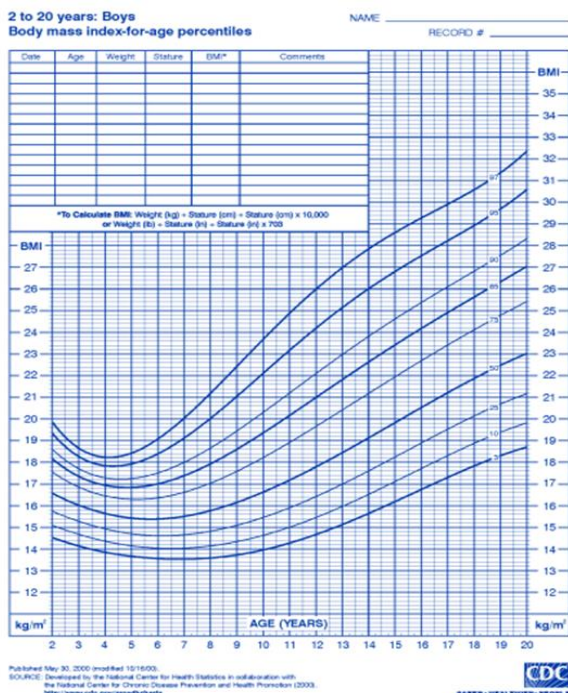


Figure 2: Body mass Index chart for children and teenager aged from 2-20 years (Source: chart: www.cdc.gov)

DISCUSSIONS

Dengue and malaria are both infectious diseases that are common in tropical countries, but there haven't been many reports of the two diseases coexisting. Because of differences in the habitats of the mosquitos that cause dengue and malaria infections, there aren't many reports on the co-infection of these two diseases. The Aedes mosquito's habitat is mostly in urban areas, whereas the malaria mosquito vector's habitat is mostly in forest areas, and not all tropical countries have both mosquito habitats [9,10].

People living in dengue or malaria endemic regions have natural immunity that can protect them from these pathogenic germs [1]. However, travelers from non-endemic regions have no immunity protection. This is consistent with the findings of Lüthi *et al.* in his study of risk factors associated with death from malaria in travelers which reported that immunity and reasons for travel was risk factors of severe malaria infection [11].

In this case, a 14-year-old boy from Makassar, which is dengue endemic but not malaria endemic, was visiting a malaria endemic area in Papua. After the trip, patient developed high fever and chills in the evening for 3 days. He also had severe headache and photophobia. Those are clinical symptoms of malaria [12]. However, after further examination, it was found that the child has abdominal tenderness, increase hematocrit, thrombocytopenia, and positive rumple leede, which were warning signs of dengue infection [13]. The microscopic examination showed trophozoite (ring shaped) (Figure 1) *Plasmodium falciparum*, so the patient was diagnosed dengue with warning signs and *Plasmodium falciparum* malaria.

Dengue infection in this case was secondary infection because the serology results detected were only anti-dengue IgG. IgG titer could last for 10 months to a lifetime, while IgM in secondary infection usually lower than in primary infection, and could be undetected in several cases depending on the type of test used [13].

According to immunological theory, good nutrition can boost antibody response, so nutritional status can influence disease severity. This theory also applies to overweight patient with dengue and malaria who are at risk of severe disease due to their immune response. It has been believed that fat tissue of adipose cells can secrete and release pro-inflammatory cytokines such as TNF α and several interleukins (IL-6, IL-8, IL-10), which are also found in dengue and malaria [14,15]. Does the increase of pro-inflammatory cytokines in overweight associated with the occurrence of severe dengue or severe malaria with complications in children? Further research and in-depth study are required to answer those question. In this case, there was no severe symptoms associated with the nutritional status and his diseases.

Dengue fever and malaria coinfection is mores severe than a single infection, particularly when thrombocytopenia (<50.000/ μ L) and anemia (<8 g/dL) are present [16]. Therefore, it is necessary to recognize the signs and symptoms of dengue and malaria coinfection earlier because it it significantly affects the treatment and outcome. The case we observed had severe thrombocytopenia (23,000 / μ L) and was immediately treated by administering isotonic fluids as fluid replacement to prevent bleeding and dengue shock. DHP and primaquine antimalarial medications enabled the patient to recover quickly. Delayed diagnosis can lead to death as reported in a case of malaria and dengue in Timor Leste [17].

The diagnosis in this case was made based on the patient's history and clinical examination and supported by hematologic results. The patient was discharged after 5 days of treatment with clinical improvement and normal hematologic results.

Conflicts of interest

None declared.

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