



(MINI REVIEW ARTICLE)



## Correlation between low platelets and malaria disease – Mini review

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Publication history: Received on 01 September 2020; revised on 07 September 2020; accepted on 09 September 2020

Article DOI: <https://doi.org/10.30574/wjarr.2020.7.3.0339>

### Abstract

Malaria is one of the major causes of disease for people living in tropical and subtropical areas. Infection with malaria parasites may result in a wide variety of symptoms, ranging from absent or very mild symptoms to severe disease and even death. Low platelets are common in the laboratory feature among patients with malaria. Causes of Low platelets in malaria till now it not clarified. In this mini review we try to find the correlation between malaria and thrombocytopenia. Malaria is associated with different degrees of low platelet count and the relationship between low platelets and malaria till now not sufficiently understood till now.

**Keywords:** Low Platelets; Thrombocytopenia; Correlation; Plasmodium; Malaria Disease

### 1. Introduction

Malaria is one of the major causes of disease for people living in tropical and subtropical areas. Despite intensive control efforts during the twentieth century, approximately 40% of the world's population remains at risk of infection. Malaria disease is parasitic infection caused by plasmodium species specially falciparum & vivax, malariae, and ovale [1]. Thrombocytopenia is common in the laboratory diagnosis of malaria and presence of thrombocytopenia is not a distinguishing feature between the two types of malaria. Its presence in patients who present with acute febrile illness in the tropics, increases the probability of malaria [2]. Falciparum malaria associated with several hematological changes that affect the major blood cell lines such as platelets lead to platelets parameters (platelets count and indices) abnormalities[3]. Hematological changes are some of the most common complications in malaria and they play a major role in malaria pathogenesis. Patients infected with malaria exhibited important changes in most of hematological parameters with low platelet, WBCs, and lymphocyte counts being the most important predictors of malaria infection [4]. Alterations of blood coagulation are thought to be involved in malaria pathogenesis. Also, in malaria patients without clinically evident bleeding or thrombotic complications, alterations of the blood coagulation system, such as decreased levels of plasma antithrombin or elevated levels of plasminogen activator inhibitor (PAI)-1, and thrombocytopenia are frequently found [1,5,6].

Most of researchers reported that, Anemia thrombocytopenia are the most frequent malaria-associated hematological complications and have received more attention in the scientific literature due to their associated mortality [7,8]. The anemia is usually due to varied reasons ranging from hemolysis to comorbidities like parasitic infections, folate, iron, and vitamin B12 deficiencies in endemic areas, antimalarials and further complicated by the coexistence of thalassemia and other haemoglobinopathies [9,10]. Regarding to thrombocytopenia during malaria however is yet to be understood clearly and what the mechanism exactly leads to lower the number of thrombocytes during malaria, some researchers hypothesize that malaria parasite produces factors that reduce the platelet production from the megakaryocytes. This saves the parasite from the platelet mediated clearance as a survival mechanism [11]. Other studies reported the mechanisms leading to thrombocytopenia are coagulation disturbances, splenomegaly, bone marrow alterations,

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antibody-mediated platelet destruction, oxidative stress, and the role of platelets as cofactors in triggering severe malaria [9,12,13,14,15]. Fajardo and Tallent demonstrated *Plasmodium vivax* within platelets by electron microscopy and suggested a direct lytic effect of the parasite on the platelets [16]. Multiple studies indicate that platelets appear to both ameliorate infection by killing parasites and compromise the host by mediating adhesion of infected erythrocytes to the vascular wall. Herein, the possible causes of malaria-induced thrombocytopenia as well as the roles of the platelets in the erythrocytic stage of the disease will be discussed [17]. Another study conducted by Steven Kho et al., demonstrates the direct pathogen-killing actions and host protective roles of platelets during human malarial infection. Given platelets show broad-spectrum antimicrobial activity, and the risks for infection associated with thrombocytopenia [18]. Another hypothesis released by R. Conte et al., that autoantibodies against platelet glycoproteins IIb-IIIa and Ia-IIa might be present during malaria and could lead to severe thrombocytopenia [19]. Lee SH et al., conducted clinical trial in plasma macrophage colony-stimulating factor and P-selectin levels in malaria and they suggest that elevated M-CSF in malaria, by enhancing macrophage activity, may result in increased macrophage-mediated platelet destruction [20]. Another study conducted by Casals et al., in Kenya about thrombocytopenia among patients with falciparum malaria and find thrombocytopenia strongly correlates with high levels of interleukin (IL)-10 [21]. Kotepui et al., observed patients during infected with malaria exhibited important changes in most of hematological parameters with low platelet, WBCs, and lymphocyte counts being the most important predictors of malaria infection. When used in combination with other clinical and microscopy methods, these parameters could improve malaria diagnosis and treatment [22]. Another study conducted by Khalid et al. concluded that the thrombocytopenia associated commonly with severe falciparum malaria and falciparum malaria hyperparasitemia particularly severe thrombocytopenia (PLTs > 50 × 10<sup>9</sup>/μl). So thrombocytopenia and their severity may help to assess the disease severity and to improve the management of falciparum malaria among patients [23]. Malaria is associated with different degrees of low platelet count generally mild or moderate and bleeding is rare even during severe malaria. The relationship between thrombocytopenia and malaria not sufficiently understood till now [24]. Also another cause for thrombocytopenia should be considered because there many normal and abnormal condition or environmental can lead to change in platelets numbers if it coming associate with malaria like, heart disease, hypertension and pregnancy thrombocytopenia (platelets 100 × 10<sup>9</sup>/L) occurs in 0.8%–0.9% of normal pregnant women, while increases in platelet factor and thromboglobulin suggest elevated platelet activation and consumption [25,26,27,28]. Thrombocytopenia may not be a cause of mortality by itself, but it can be a marker of increased severity and need of aggressive management [29].

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## 2. Conclusion

Malaria is associated with different degrees of low platelet count and the relationship between low platelets and malaria till now not sufficiently understood till now.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

The authors have declared that no competing interests exist.

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