Original Article

Diagnostic Value of Platelet Count in Malaria

Microbiology Section

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ABSTRACT

Objective: To evaluate the significance of the platelet count in the diagnosis of malaria.

Design: A hospital based prospective study.

Place and Duration of Study: Department of Microbiology, AJIMS, Mangalore. From January 2010 to July 2010.

Material and Methods: A total of 1101 patients with a short history of febrile illness were included in the study. The peripheral blood was tested for malarial parasites by the quantitative buffy coat (QBC) method. The complete blood counts of all the subjects were done by using an automated haematology analyzer.

Results: Among the 1101 patients with febrile illness who participated in the study, 267 were positive for malaria by the QBC method. Of these, 221 patients had thrombocytopaenia.

Conclusion: Thrombocytopaenia is a common haematological finding in malaria, having a sensitivity of 83% and a specificity of 68%. Our study stresses the importance of thrombocytopaenia as an indicator for acute malaria.

Key Words: Thrombocytopenia, *Plasmodium vivax*, *Plasmodium falciparum*

INTRODUCTION

Malaria is a major health problem worldwide, with 300-500 million cases of malaria occurring annually, and an estimated 1.1-2.7 million deaths each year as a result of malaria [1-5]. Malaria is endemic in 91 countries [6-11] and India contributes 77% of the total malaria cases in Southeast Asia [12-18].The delay in the diagnosis and treatment is the leading cause of death in many countries [4]. Early diagnosis remains the key to the effective management of malaria [1], [2], [3]. The clinical diagnosis is unreliable and can only be 50% accurate [1], [2], [3]. Diseases like enteric fever, viral infections, and leptospirosis can present themselves similarly [1], [3]. The examination of thick and thin blood films under the light microscope is the gold standard in the diagnosis of malaria. It is informative and inexpensive but it requires expertise and repeated smear examinations [1], [3], [4]. PCR is the most sensitive method but it cannot be used for routine purposes [1], [4]. The malarial antigen based rapid diagnostic tests are a valid alternative to microscopy, but they are expensive [1]. The quantitative buffy coat (QBC) method is a rapid and sensitive test for diagnosing malaria in numerous laboratory settings [4]. Various haematological abnormalities have been reported in malaria. Among these, thrombocytopaenia is very common [1], [10], [17]. The aim of this study was to identify the significance of thrombocytopaenia in malaria and its relevance as an early diagnostic tool in malaria. The presence of thrombocytopaenia may heighten the suspicion of malaria, thus prompting a more diligent search for the malarial parasite and an early administration of the specific therapy.

MATERIALS AND METHODS

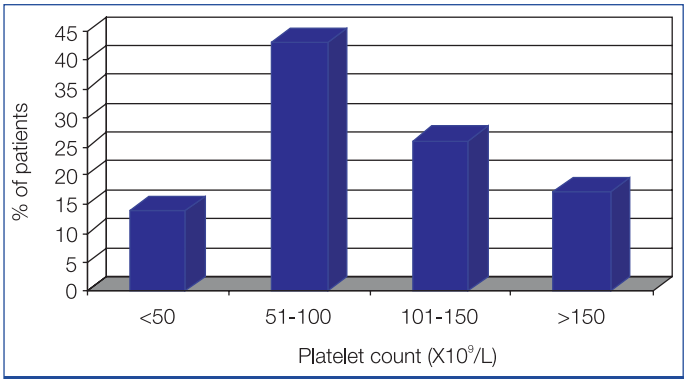
One thousand one hundred and one patients with a history of acute febrile illness, who presented to us between January 2010 and July 2010, were included in this study. Patients of all ages were included. After taking a detailed clinical history, physical examination was undertaken in these patients. The patients having localising signs towards specific disorders were excluded from the study. Blood was collected from each patient in a hematocrit tube containing acridine orange and an anticoagulant and this was tested for malaria by the QBC method. Blood was also collected in an ethylene diamine tetra acetic acid [EDTA] tube and a complete blood cell count was done by using an automated cell count analyzer (Lab Life, Dianoua). A platelet count of less than 150 $x10^9$/L was used to define thrombocytopaenia.

RESULTS

A total of 1101 patients with acute febrile illness were included in the study. 267 of these were diagnosed to have malaria by the QBC technique.138 patients had Plasmodium vivax infection, 3 patients had *Plasmodium falciparum* infection and 126 had mixed infection with both *Plasmodium vivax* and *Plasmodium falciparum*. The platelet count in these patients ranged from $20x10^9$/L to $282x10^9$/L. Of these, 221 patients had thrombocytopaenia, whereas 46 patients (17%) had a normal platelet count. Among the thrombocytopaenic patients, 114 had *Plasmodium vivax* infection, three patients had *Plasmodium falciparum* infection and 104 patients had mixed infection. Further analysis of the data showed that most of these patients (43%) had platelet counts between 51 to $100x10^9$/L,. 14% of the patients had platelet counts between 101 to $150x10^9$/L and that 17% of the patients had platelet counts below $50x10^9$/L. A very low platelet count ($20x10^9$/ L) was also seen in few cases. [Table/Fig-1]

DISCUSSION

A variety of haematological alterations in malaria have been reported by various studies, as blood counts are now readily available with the use of automated analyzers, even at the primary health care centers. These include progressively decreasing haemoglobin,



[Table/Fig-1]: Distribution of Platelet Count in malaria

thrombocytopaenia, leucocytosis, leucopaenia, reticulocytosis and disseminated intravascular coagulation [1], [2], [3], [14].

Among the various haematological changes in malaria, thrombocytopaenia is the most consistent one, which occurs in more than half of the patients [1], [14]. In endemic areas, malaria has been reported as the major cause of low platelet counts [15]. This is so characteristic of malaria, that in some places, it is used as an indicator of malaria in patients presenting with fever [1]. Platelet counts of less than 150×10^9/ L increase the likelihood of malaria by 12–15 times [3]. Many studies have been done to Support this finding. In one such study, thrombocytopaenia was seen in about 85% of the patients with uncomplicated malaria and in all the patients with severe falciparum malaria [1]. Jamal et al, in their study on paediatric patients from Karachi, have reported low platelet counts in 72% of their patients who were suffering from *Plasmodium vivax* infection [19]. A study which was done by Saleem Ahmed Khan et al from Lahore reported thrombocytopaenia to be present equally in both the *P.vivax* (82.5%) and the *P. falciparum* (86.4%) infections [1]. A study from India reported 77.77% sensitivity and 78.66% specificity [2]. Thrombocytopaenia has also been reported in asymptomatic *P. falciparum* infected Women and children from Nigeria [7]. Pregnant women become more thrombocytopaenic than non-pregnant women with acute uncomplicated malaria [7]. In our study, thrombocytopaenia was present both in the *P. vivax* and the *P. falciparum* infections. Thrombocytopaenia has a sensitivity of 83% and a specificity of 68% here. Our results were generally comparable with those of most of the studies, thus signifying the association of thrombocytopaenia with malaria. The decreased specificity of thrombocytopaenia in our study may be because our area is endemic for viral diseases like Dengue and Chikungunea, which could also cause thrombocytopaenia.

The precise mechanism behind thrombocytopaenia, however, remains unclear. Both the immunological as well as the non-immunological destruction of platelets have been implicated [1], [14], [9], [13], [17]. Decreased thrombopoiesis has been ruled out, because platelet-forming megakaryocytes in the marrow are usually normal or increased [1]. Other postulates include peripheral destruction and the consumption of platelets [1]. Immune complexes which are generated by the malarial antigen lead to the sequestration of the injured platelets by the macrophages in the spleen [1], [11], [10], [16]. This is supported by the finding that malaria patients have elevated levels of platelet-bound IgG [1], [11], [3], [9]. Some investigators have suggested disseminated intravascular coagulation as a major mechanism in malaria [1], [6], [8], but others have found no evidence of disseminated intravascular coagulation in any of their patients, including those with severe thrombocytopaenia [1]. Another proposed mechanism is that the platelets engulf the malarial parasites, and that in the process, they are damaged and removed from the circulation [1]. Elevated levels of IL-10 [11], [3], [6], a shortened platelet life span in the peripheral blood and the clumping of platelets have also been suggested as the reasons for thrombocytopaenia [14], [7], [19], [20], [21]. These mechanisms may coexist in the patients and they may interfere with each other [11].

Thrombocytopaenia is reported to be present in both *P. falciparum* and *P. vivax* infections [1], [22]. In our study also, thrombocytopaenia was seen in both the *P. falciparum* and the *P. vivax* infections [1]. Many of the patients who were included in our study had mixed infection with *P. falciparum* and *P. vivax*. This may be because our area is endemic for malaria. A longitudinal genetic analysis of the composition of the malarial parasites which infect humans has demonstrated that individuals living in endemic areas are chronically infected with multiple genotypes and species of Plasmodium. The accumulation of infections is a consequence of a super infection from the bites of many infected anopheline mosquitoes [20]. Studies which were done in animal models showed an association of the mixed genotype with a higher transmission success and higher gametocytaemia [21] .

A good tolerance of low platelet counts is well known in malaria [14]. This could be explained by platelet activation and an enhanced aggregability [8]. In most of the studies, thrombocytopaenia was neither associated with the severity of the disease or death in malaria [6], [16]. It usually disappears with the treatment of the disease and requires no treatment for itself [11]. It has been reported that anaemia is the next best parameter which increases the probability of malaria [3]. But in our study, anaemia was seen only in 18% of the malarial infections. Both leucocytosis and leucopaenia have been described in malaria [3]. Leukocytosis was commonly observed in our study (80%). Thrombocytopaenia has emerged as the strongest predictor of malaria, a previous observation which we have confirmed.

CONCLUSION

Thrombocytopaenia is associated with both *P. falciparum* and *P. vivax* infections. Its presence in patients who present with acute febrile illness in the tropics, increases the probability of malaria. This may be used in addition to the clinical assessment, to heighten the suspicion of this disease. In an endemic area, the platelet count has to be checked in all patients who present with acute febrile illness. If thrombocytopaenia is present, malaria has to be ruled out before performing expensive tests to rule out other febrile conditions, so that a prompt treatment can be initiated.

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