Original article:

Platelet Count and Its Diagnostic Value in Malaria Patients among Western U.P. Population

Seema Awasthi

Assistant Professor, Department of Pathology, TMMC & RC, Moradabad, UP, India.

Corresponding Author: Dr. SeemaAwasthi, Assistant Professor, Department of Pathology, TMMC&RC, Moradabad, UP, India.

Abstract

Introduction: Platelets play a critical role in the pathogenesis of malarial infections by encouraging the sequestration of infected red blood cells within the cerebral vasculature. Platelets also have well-established roles in innate protection against microbial infections. The aim of this study was to identify the significance of thrombocytopaeniain malaria and its relevance as an early diagnostic tool in malaria.

Methods: Study was conducted on 200 diagnosed cases of malaria in department of pathology, TeerthankerMahaveer Hospital, Moradabad (UP) India. Special case sheets were prepared. Patients of all ages were included. Patient's history, including identity of patient, age, sex, address and clinical examination was recorded.

Results: analysis of the data showed that most of these patients 143 (71.5%) had mild thrombocytopenia. 19 (9.5) had moderate thrombocytopenia and 8(4%) had sever thrombocytopenia.

Conclusion: Our study showed that thrombocytopenia is related to malaria complications. A reduction in the number of platelets is one of the more well-known hematologic changes observed in patients with malaria. Most of the malaria patients in our setup have thrombocytopenia but it is benign in nature and improves in uncomplicated cases without a need of platelet transfusions.

Keywords: Platelet Count, Malaria, Thrombocytopenia.

Introduction:

It is an endemic disease in Western UP. Being one of the world's biggest killers, it accounts for approximately one million deaths each year.[1] 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. [2-6] Malaria is a disease caused by infection with Plasmodium parasites.[7] Plasmodium falciparum is the main cause of malaria-related death worldwide; however, other species can also cause serious illness.[8,9] Clinical complications in malaria patients include cerebral malaria, severe anemia (SA), acute kidney failure (AKF), pulmonary edema (PE), severe hypoglycemia, shock, disseminated intravascular coagulation (DIC), acidosis and massive hemolysis. A patient who presents with one or more of these conditions is diagnosed with severe malaria (SM) and has an increased risk of mortality.[10]

Different organs can be affected during a malaria episode, which results in localized or systemic injury. Hematological changes, especially anemia and thrombocytopenia, are common.[11, 12] A varieties of abnormalities of blood and bone marrow cells may be found in P. falciparum and P. vivax malaria. Severe anaemia may occur in children with acute or chronic

falciparum malaria with various degrees of parasitaemia. The possible pathogenesis of the haematological abnormalities may be parasite products, T-cell-derived cytokines, macrophage activation, macrophage-derived factors such as tumour necrosis factor-α, and macrophage dysfunction.[13] Platelets play a critical role in the pathogenesis of malarial infections by encouraging the sequestration of infected red blood cells within the cerebral vasculature. Platelets also have well-established roles in innate protection against microbial infections. Inhibition of platelet function by aspirin and other platelet inhibitors inhibited the lethal effect of human platelets which they exert on P. falciparum parasites. 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.[2, 4, 5] PCR is the most sensitive method but it cannot be used for routine purposes.[2,5] The malarial antigen based rapid diagnostic tests are a valid alternative to microscopy, but they are expensive.[2]

Those with malarial retinopathy were more thrombocytopenic than those without. Although absence of thrombocytopenia is uncommon in malaria, its presence is not a distinguishing feature between its types. It is a general consensus that thrombocytopenia is very common in malaria.[14]

Considering the common occurrence of thrombocytopenia in various types of malaria, this study was conducted to assess frequency of low platelet count in patients suffering from malaria in our setup. 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. The aim of this study was to identify the significance of thrombocytopaeniain malaria and its relevance as an early diagnostic tool in malaria.

Materials and Methods

This prospective, descriptive and analytical study was conducted on 200 diagnosed cases of malaria in department of pathology, TeerthankerMahaveer Hospital, Moradabad (UP) India,. Special case sheets were prepared. Patients of all ages were included. Patient's history, including identity of patient, age, sex, address and clinical examination was recorded. Investigations were conducted to look for malarial parasite, its type and platelet count in all the patients presenting with suspicious of malaria. Exclusion criteria were chronic liver disease, thrombocytopenia due to drug intake, bleeding disorder or other conditions which can cause thrombocytopenia. The patients having localising signs towards specific disorders were excluded from the study. The diagnosis of malaria was carried out by thin and thick blood films. Platelet count was performed using an automated Counter and blood smear was seen by pathologist. 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 x109/L was used to define thrombocytopaenia. Thrombocytopenia was classified as mild $(50–150(10)^3$ cells/µl), moderate $(20–50(10)^3$ cells/µl) and severe (<20(103) cell/µl).[15] IBM SPSS Statistics 21 manufactured by IBM USA was used for entire calculations.

Results:

A total of 996 patients with acute febrile illness were included in the study. 200 of these were diagnosed to have malaria by the QBC technique. 129 patients had Plasmodium vivax infection, 2 patients had Plasmodium falciparum infection and 69 had mixed infection with both Plasmodium vivax and Plasmodium falciparum. The platelet count in these patients ranged from 20 x 109/L to 282 x 109/L. Of these, 170 patients had thrombocytopenia, whereas 30patients had a normal platelet count. Among the thrombocytopaenic patients, 109 had Plasmodium vivax infection, three patients had Plasmodium falciparum infection and 89 patients had mixed infection. Further analysis of the data showed that most of these patients 143 (71.5%) had mild thrombocytopenia. 19 (9.5) had moderate thrombocytopenia and 8(4%) had sever thrombocytopenia. Table 1, Figure 1.

Table-1: Platelet count in patients of malaria

Platelet Count	No. of Patients	Percentage	Mean platelet count ×103/µl
Normal	30	15%	231.22±27.9
Mild	143	71.5%	88±11.5
Moderate	19	9.5%	29.5±10.5
Severe	8	4%	8.5±3.5
Thrombocytopenia	170	85%	76.10±50.65

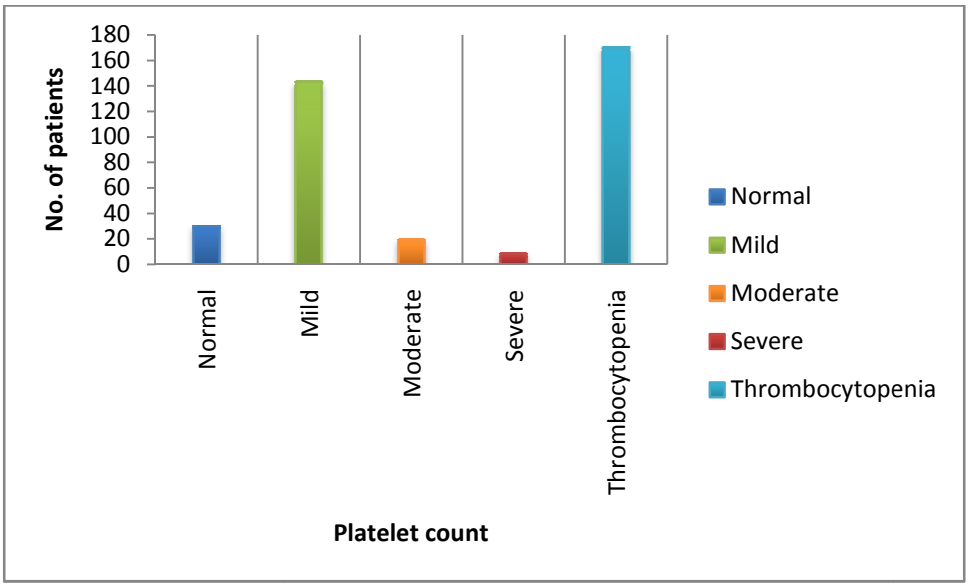

Figure-1: Platelet count in patients of malaria

Discussion

This study revealed that 143 (71.5%) had mild thrombocytopenia (p<0.5). 19 (9.5%) had moderate thrombocytopenia and 8(4%) had sever thrombocytopenia. A study carried out in Pakistan showed that overall, 87.27% of malaria patients were found to have low platelet count.[16]This is comparable to our results. Malaria is usually associated with various degrees of thrombocytopenia.[17] One study has reported that 58% patients with malaria have thrombocytopenia which is lower than our study. High incidence of thrombocytopenia was a common haematological finding in patients with Plasmodium vivax infection. The presence of thrombocytopenia in a patient with acute febrile illness increases the probability of malarial infection in endemic areas and may increase suspicion of malaria in settings where technical laboratory support is not available. A study carried out in Pakistan has shown that out of 370 cases, 114 (30.81%) had normal platelet counts, and 256 (69.18%) had thrombocytopenia (p<0.05).[18]

Thrombocytopaenia is reported to be present in both P. falciparum and P. vivax infections.[19,20] In our study also, thrombocytopaenia was seen in both the P. falciparum and the P. vivax infections. [20]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.[21] Studies which were done in animal models showed an association of the mixed genotype with a higher transmission success and higher gametocytaemia.[22]

Thrombocytopenia has been seen commonly in all forms of malaria. Different mechanisms have been proposed as immune mediated mechanisms including immune destruction of circulating platelets, splenic pooling, and reduced platelet lifespan. New research reveals that platelets stimulate the immune system and turns on molecules that increase inflammation. It has been found that platelets could bridge the interaction of infected erythrocytes with endothelial cells.[23]It has been observed that frequencies of plasma circulating micro-particles were also markedly increased in P. vivax patients, as compared to healthy age-matched malaria-unexposed controls. The platelet derived micro-particles increased in a linear fashion with the presence of fever and length of acute symptoms.[24]

Conclusion

A reduction in the number of platelets is one of the more well-known hematologic changes observed in patients with malaria. Most of the malaria patients in our setup have thrombocytopenia but it is benign in nature and improves in uncomplicated cases without a need of platelet transfusions. 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.

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