

Diagnostic significance of thrombocytopenia in malaria and its correlation with type and severity of malaria

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Abstract

Background: The malaria is a complex disease which present with fever but brings many pathological changes in all the tissues including hematological changes. The studies have found besides anemia. The qualitative and quantitative changes in leukocytes and platelets are significant and may be used as presumptive markers in a symptomatic smear negative cases. These features will be more useful in endemic areas and during epidemics of disease.

Material and Methods: In the study we have studied hematological parameters with emphasis on platelets counts in cases of malaria. Out of 150 cases, The malaria was confirmed in 100 cases by smear as well as, Immunochromatography test (ICT). The thrombocytopenia and other hematological anomalies were recorded and analyzed.

Result: The study revealed 75% of malaria positive cases had thrombocytopenia which was more severe in cases of P. falciparum.

Conclusion: Thrombocytopenia showed a statistically significant correlation with malarial infection. Our study stresses the importance of thrombocytopenia and its correlation with type and severity of malaria.

Key Words: Thrombocytopenia, Plasmodium vivax, plasmodium falciparum Immunochromatography test (ICT).

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Introduction

Malaria is one of the most common hematological parasite in tropical and subtropical countries particularly Africa and Asia. More than 40% of the world population reside in malaria-endemic area and it is predictable than 300-500 million cases and 1.5-2.7 million deaths will occur in each coming year.¹ Clinical presentation of malaria includes fever chill, sweating, vomiting, headache, abdominal pain, haepatomegaly and splenomegaly². Various hematological abnormalities have been reported in malaria like neutrophilia, lymphopenia and thrombocytopenia. Among these thrombocytopenia is most common complication recognized for both species of malaria, viz-P. falciparum and P.vivax^{3,4}. The clinical diagnosis of malaria is challenging as signs and symptoms overlap with other febrile illness. The gold standard for diagnosis is smear positivity. Among the haematological abnormality thtombocypaenia is common.

Material and Methods

A total of 150 patients with history of acute febrile illness, ether hospitalized or out patients presented to us

between Aug 2013 to Sept 2015. Patients of all ages where included in this study. After taking a detailed clinical history, physical examination was under taken in these patient.

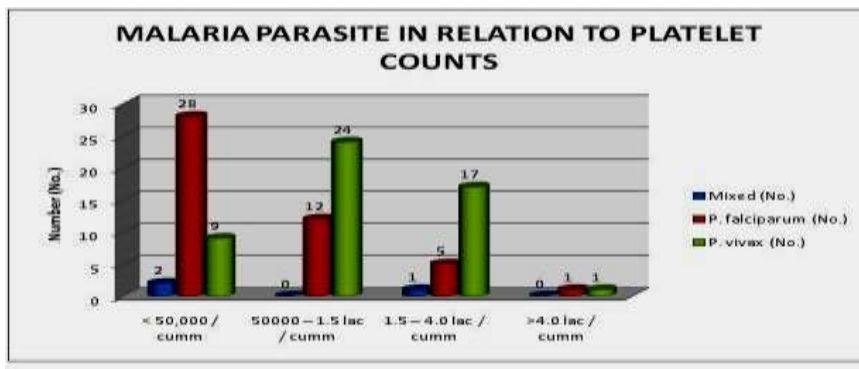
All the patients having localizing signs indicating specific disorders where excluded from the study. Blood examination by peripheral blood smear preparation stained by Leishman's field's stains were examined. All cases were subjected to ICT examination also. Blood was collected in an ethylene diamine tetra acetic acid (EDTA) tube and complete blood cell count was done by using an automated cell count analyzer. A platelet count of less than $150 \times 10^9/L$ was used to define thrombocytopenia.

Result

A total of 150 patients with short history of fever where included in the study. One hundred of these were positive for malaria. Fifty one patients had P.vivax infection. 46 had P. flaciparum infection and 3 had mixed infecation. 75% patients of these patient showed thrombocytopenia. Thrombocytopenia was defined as platelet count $<150,000/\mu L$. The median of platelet count in patients with falciparum malaria ($72.5 \times 10^3/\mu L$) and vivax malaria ($89 \times 10^3/\mu L$) were significantly lower than those with non-malaria ($282 \times 10^3/\mu L$) group (P value <0.0001).

Platelet counts / mm ³	Mixed	P. falciparum	P. vivax	Malaria Cases (n=100)	Normal Cases (n=50)	
					No.	%
< 50,000 / cumm	2	28	9	39	0	0.0
50000 – 1.5 lac / cumm	0	12	24	36	0	0.0
1.5 – 4.0 lac / cumm	1	5	17	23	50	100.0
>4.0 lac / cumm	0	1	1	2	0	0.0
Total	3	46	51	100	50	100.0

Table/Fig. 1: Distribution of platelet count in malaria



Table/Fig. 2: Distribution of platelet count in malaria

Discussion

Despite numerous advances in diagnostic methods and treatment modalities, the worldwide incidence of malaria is still about 300-500 million cases annually with 1.1 to 2.7 million deaths. Around 40% of the global population at risk of malaria resides in the South-East Asian Region. In the Indian subcontinent, distribution is heterogeneous and governed by many climatic and physiological risk factors. However, *Plasmodium vivax* is the major malaria parasite in India, contributing towards the majority of cases⁵.

Hematological changes are some of the most common complications in malaria and they play a major role in malaria pathogenesis. These changes involve the major cell types such as RBCs, leucocytes and thrombocytes.^{6,7,8} Malaria infected patients tend to have significantly lower platelets, WBCs, lymphocytes, eosinophils, RBCs and Hb level, while monocyte and neutrophil counts are significantly higher in comparison to non-malaria infected patients.^{9,10,11,12}

Malaria can affect any age group. However most studies show more of adults as compared to children. The present study had 70 adult patients and 30 children comparable to Potkar et al⁶. The adult age group 30-45 is more affected due to their greater mobility and greater risk of exposure due to more outdoor activity.

Present study had 52% males as compared to females 48%. Other studies with comparable results include Erhart et al⁸ with 69% males and Bashwari et al⁵ with 75.9% males. The female are at lower exposure

risk due to lesser mobility in male dominated society, and apathy towards treating illness in females may all contribute towards more number of male cases.

The most common species of malaria in the present study was vivax (51%) closely followed by falciparum (46%). In studies conducted by Erhart et al¹³, Jadhav et al¹⁴ vivax was the most common species while Rojansthein et al¹⁵ and Bashwari et al⁵ reported higher falciparum prevalence.

The clinical diagnosis of malaria is challenging because of the non-specific nature of the signs and symptoms, which overlap considerably with other diseases presenting with fever in tropical regions. This leads to indiscriminate use of anti-malarial, thereby compromising the quality of care for patients with non-malarial fevers in endemic areas¹¹. The gold standard for laboratory diagnosis of malaria is the demonstration of the malarial parasite on microscopy which requires technical expertise and a tedious procedure that needs repeated smear examinations. Hematological abnormalities are considered a hallmark of malaria and statistical analyses have shown that many of these hematological values may lead to an increased clinical suspicion for malaria, thus initiating a prompt institution of specific therapy even in the absence of a positive smear report for malaria. A variety of hematological alterations like progressively increasing anemia, thrombocytopenia, leukocytosis or leukopenia have been reported in cases of malaria.¹⁶

The suggested mechanism of thrombocytopenia in malaria may be through peripheral

destruction, excessive removal of platelets by splenic pooling as well as platelet consumption by the process of disseminated intravascular coagulation (DIC)¹⁷. In this study we found 65 patients with Thrombocytopenia (65%) in the malaria-infected group. The median of platelet count in patients with falciparum malaria ($72.5 \times 10^3/\mu\text{L}$) and vivax malaria ($89 \times 10^3/\mu\text{L}$) were significantly lower than those with non-malaria ($282 \times 10^3/\mu\text{L}$) group (P value<0.0001). Thrombocytopenia was also associated with anaemia in the malaria group ($r=-0.107$, P value=0.004) and also related to age ($r=-0.235$, P value<0.0001).

Thrombocytopenia is the most common finding, irrespective of the type of malaria seen in patients. Presence of thrombocytopenia in a patient of acute febrile illness in the tropics increases the probability of malaria and can be a helpful clinical indicator for starting therapy. However thrombocytopenia is not a distinguishing feature between the two types of malaria. The mechanism of thrombocytopenia in malaria is uncertain. Immune-mediated lysis, sequestration in the spleen and a dyspoietic process in the marrow with diminished platelet production have all been postulated. Abnormalities in platelet structure and function have been described as a consequence of malaria, and in rare instances platelets can be invaded by malarial parasites themselves.

Studies conducted by Bashwari et al⁵ and Jhadav et al¹⁴ shows thrombocytopenia more in vivax as in the present study while in studies conducted by Horstmann et al¹⁷ and Erhart et al¹³, thrombocytopenia is more in cases of falciparum malaria.

Conclusion

As observed in this study that hematological changes such as anemia, thrombocytopenia and leucopenia showed a statistically significant correlation with malarial infection. We concluded that routinely used laboratory findings such as hemoglobin, leukocyte and platelet counts and even red cell distribution width values can provide a diagnostic clue in a patient with acute febrile illness in endemic areas, thus increasing the probability of correctly diagnosing malaria and enhancing prompt initiation of treatment. The limitation of resources and trained health personnel in much of the malaria infested areas, presumptive clinical diagnosis seems a relevant option.

Reference

1. World Health Organisation. World malaria situation in 1994. Parts1-111. Weekly Epidemiol Rec 1997;72:269-90.
2. Leder K, Weller PF. Epidemiology, pathogenesis, clinical features and diagnosis of malaria. Up To Date Online 1999;7:1-6.
3. Jojera AS, Hathila RN, Patel PR, Tailor HJ. Changes in WBC and platelet count in patients with malaria: a hospital based comparative study. Int J Res Med Sci 2013;1:401-3.

4. Malik NA, AhemadTM, Khan A, Jaffery S et al. Malaria; Assessment of hematological changes. Professional Med J,2013;20(2):227-3.
5. Bashawri LA, Mandil AA, Bahnassy AA, Ahmed MA. Malaria: hematological aspects. Ann Saudi Med 2002;22(5-6):372-6.
6. Potkar CN, Kshirsagar NA, Kathuria R. Resurgence of malaria and drug resistance in plasmodium falciparum and plasmodium vivax species in Bombay. J Assoc Physicians India 1995 May;43(5):336-8.
7. Koltas IS, Demirhindi H, Hazar S, Ozcan K. Supportive presumptive diagnosis of plasmodium vivax malaria. Thrombocytopenia and red cell distribution width. Saudi Med J 2007;28(4):535-9.
8. Tangpukdee N, Duangdee C, Wilairatana P, Krudsood S. Malaria diagnosis: a brief review. Korean J Parasitol 2009 Jun;47(2):93-102.
9. Ali Hassan Abro, Abdulla Mahmood Ustadi, Nadeem Javeed Younis, Ahmed Saleh Abdou, Dujana Al Hamed, Ahmed Alhaj Saleh. Malaria and hematological changes. Pak J Med Sci 2008;24:287-291.
10. Price RN, Simpson JA, Nosten F, Luxemburger C, Hkirjaroen L, ter Kuile F, et al. Factors contributing to anemia after uncomplicated falciparum malaria. Am J Trop Med Hyg 2001;65(5):614-622.
11. Sharma SK, Das RK, Das BK, Das PK. Haematological and coagulation profile in acute falciparum malaria. J Assoc Physicians India 1992;40(9):581-3.
12. Lathia TB, Joshi R. Can hematological parameters discriminate malaria from nonmalarious acute febrile illness in the tropics? Indian J Med Sci 2004;58(6):239-244.
13. Erhart LM, Yingyuen K, Chuanak N, Buathong N, Laoboonthai A, Miller RS et al. Hematological and clinical indices of malaria in a semi-immune population of western Thailand. Am J Trop Med Hyg 2004;70:8-14.
14. Jadhav UM, Patkar VS, Kadam NN. Thrombocytopenia in malaria – correlation with type and severity of malaria. J Assoc Physicians India 2004 Aug;52:615-8.
15. Rojanasthien S, Surakomalleart V, Boonpucknavig S, Isarangkura P. Hematological and coagulation studies in malaria. J Med Assoc Thai 1992;75 Suppl 1:190-4.
16. Maina RN, Walsh D, Gaddy C, Hongo G, Waitumbi J, Otieno L, et al. Impact of plasmodium falciparum infection on haematological parameters in children living in Western Kenya, Malar J 2010;9(Suppl. 3):S4.10.1186/1475-2875-9-S3-S4.
17. Horstmann RD, Dietrich M, Bienzle U, Rasche H. Malaria induced thrombocytopenia. Blut 1981;42:157-64.