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Study of association of thrombocytopenia with *plasmodium vivax* infection

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ABSTRACT

Background: Malaria is a protozoan disease, transmitted by the bite of infected female anopheles mosquito. It is the most important parasitic disease of human with transmission in 107 countries containing three billion people and causing 1-3 million deaths each year. *P. Vivax* and *P. Falciparum* infections are always associated with haematological abnormalities like normocytic normochromic anaemia, initial leukocytosis followed by leukopenia with monocytosis and thrombocytopenia. **Materials and methods:** Total 250 indoor patients of medicine and paediatric department, over the period of 2 years from April 2007 to March 2009, were included in the study. All the study subjects were identified positive for malaria parasites on peripheral blood smear examination with conventional microscopy. For the conformation of the isolated infections of P. Falciparum and P. Vivax, we had also used 'OptiMAL ® Rapid Malaria Dipstick Test'. Platelet count was done on a fully automated, quantitative Abacus BC 3200 Auto Haematology Analyzer. **Results:** Severe thrombocytopenia is more common with *P. Falciparum* (20.83%) and mixed infection (16.67%) as compared to *P. Vivax* infection (7.33%), although *P. Vivax* infection had significant number of cases with moderate (36.67%) and mild thrombocytopenia (38%). **Conclusion:** Presence of thrombocytopenia is not a distinguishing feature between the *P. Falciparum* and *P. Vivax* infection. In patients with acute febrile illness and with marked thrombocytopenia, *P. Vivax* should also be kept as a differential diagnosis.

Key words: *Malaria, Plasmodium vivax infection, thrombocytopenia*

INTRODUCTION

Malaria is the most important parasitic disease of human with transmission in 107 countries containing three billion people and causing one to three million deaths each year.[1] In malaria infection, the parasite resides inside the red blood cells of human host, disturbing the physiology of red blood cell.[2] Malaria is a common infection in most parts of India and is associated with few haematological abnormalities like normocytic normochromic anaemia, initial leukocytosis followed by leukopenia with monocytosis and thrombocytopenia.[1,3] Severe thrombocytopenia is common in isolated falciparum and mixed falciparum/vivax malaria. In our study, thrombocytopenia is associated with *Plasmodium vivax* infection also.

MATERIALS AND METHODS

Total 250 indoor patients of medicine and paediatric department, over the period of two years from April 2007 to March 2009, were included in the study. All the study subjects were identified positive for malaria parasites on peripheral blood smear examination with conventional microscopy.

When parasites (trophozoites, schizonts and gametocytes) were found, an approximate numbers of parasites per thick film field (×100 objective) were counted as given below.

1+ → 1-10 parasites per 100 thick films
2+ → 11-100 parasites per 100 thick films
3+ → 1-10 parasites per thick film field
4+ → >10 parasites per thick film field.[4]

For the conformation of the isolated infections of *P. Falciparum* and *P. vivax*, we had also used 'OptiMAL® Rapid Malaria Dipstick Test'. This test detects the presence of plasmodium lactate dehydrogenase, an enzyme produced both by the sexual and asexual forms of the parasite. This test detects parasitemia levels of 100-200 parasites per micro liter of blood corresponding to a parasitemia of 0.002-0.004%.

Platelet count was done on a fully automated, quantitative Abacus BC 3200 Auto Haematology Analyzer. Platelet count was the number of thrombocytes derived from directly measured platelet pulses, multiplied by a calibration constant and expressed in thousands of thrombocytes (platelets) per micro liter of whole blood.

OBSERVATION

Incidence of *P. vivax* infection (52%) was highest during the study period [Table 1]. Age incidence showed that highest cases affected due to malaria were adults. As malaria morbidity burden in adult is large, it requires broader health and development goals to eradicate it [Table 2]. For both *P. vivax* and *Plasmodium falciparum* infection, male population was more affected than females [Table 3]. Severe thrombocytopenia is more common with *P. falciparum* (20.83%) and mixed infection (16.67%) as compared to *P. vivax* infection (7.33%), although *P. vivax* infection had significant number of cases with moderate (36.67%) and mild thrombocytopenia (38%) [Table 4].

DISCUSSION

Thrombocytopenia is common among people indigenous to the tropics[5,6] and non immune subjects[7-9] infected by *P. falciparum* or *P. vivax*. In tropical areas, malaria has been reported as one of the major cause of low platelet counts.[10]

Profound thrombocytopenia is a well recognized complication of falciparum malaria but has been less well described in vivax malaria. Our study showed presence of strong association of thrombocytopenia with vivax infection. Total 123 cases out of 150 were having thrombocytopenia (82%) and 11 patients were having

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Table 1: Incidence of malaria

Infection	*Cases (%)*
P. vivax [Figures 1 and 2]	130 (52)
P. falciparum [Figures 3 and 4]	96 (38.4)
Mixed [Figure 5]	24 (9.6)
Total	250 (100)

P. vivax: Plasmodium vivax, P. falciparum: Plasmodium falciparum

Table 2: Age incidence of malaria infection

Age group in years	*Cases*	*Percentage*
0-10	40	16
11-20	42	16.8
21-30	63	25.2
31-40	79	31.2
41-50	18	7.2
>50	09	3.6

Table 3: Sex distribution of malaria infection

Infection	*Male*	*Percentage*	*Female*	*Percentage*
P. vivax	77	51.33	53	53
P. falciparum	60	40.00	36	36
Mixed	13	8.67	11	11
Total	150	100	100	100

vivax: Plasmodium vivax, P. falciparum: Plasmodium falciparum

Table 4: Platelet count and malaria infection

Platelet count (per µL of blood)	*P. vivax*	*%*	*P. falciparum*	*%*	*Mixed*	*%*
<50,000 Severe thrombocytopenia	11	7.33	20	20.83	07	16.67
1,00,000-50,000 Moderate thrombocytopenia	55	36.67	45	46.88	08	37.50
1,00,000-1,50,000 Mild thrombocytopenia	57	38.00	23	23.96	06	29.17
>1,50,000 No thrombocytopenia	27	18.00	08	8.33	03	16.67

P. vivax: Plasmodium vivax, P. falciparum: Plasmodium falciparum

platelet count below 50,000 per micro liter of blood (severe thrombocytopenia). As compared to thrombocytopenia in *P. vivax* infection, cases of *P. falciparum* infection were more in our study, but thrombocytopenia with *P. vivax* was also not negligible. Many studies showed significant correlation between thrombocytopenia and *P. vivax* infection. Out of 173 cases of malaria in U.S. Soldiers reported by Martelo *et al.*[11] in 1969, 93% had *P. vivax* but only 15% had thrombocytopenia with no documentation of the lowest platelet count. In Horstmann's series,[12] the lowest count in 39 cases of vivax malaria was 44×10^9/L. Pukrittayakamee *et al.*[13] described a case of a volunteer, experimentally infected with the Chesson's strain of *P. vivax* with a platelet count of 20×10^9/L. Recently a case of vivax malaria associated with an initial platelet count of 5×10^9/L was reported from India.[14]

The mechanism of thrombocytopenia in malaria is uncertain. Malaria related thrombocytopenia may result from either a decrease in platelet production or an increased platelet turnover due to different mechanisms of destruction. A central mechanism is unlikely since increased numbers of megakaryocytes are found in patients with acute malaria.[15,16]

Fajardo and Tallent[17] demonstrated *P. vivax* within platelets by electron microscopy and suggested a direct lytic effect of the parasite on the platelets. Both non immunological

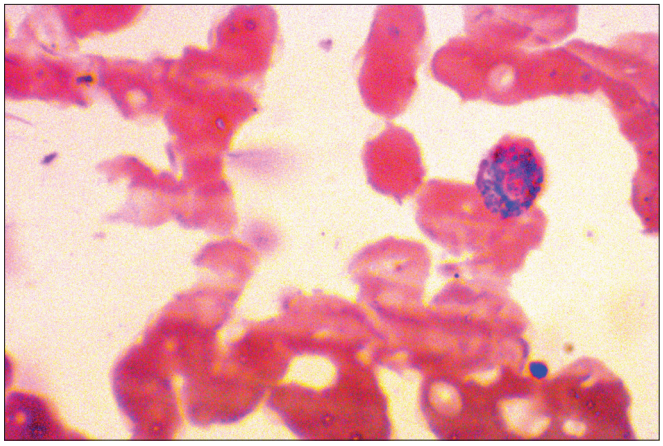

Figure 1: Schizont of *Plasmodium vivax* with thrombocytopenia

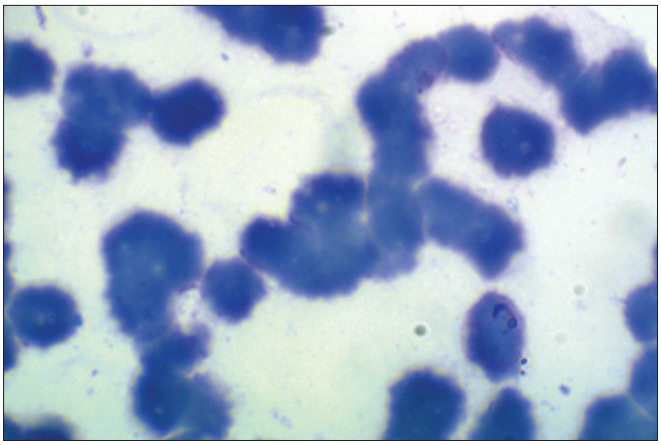

Figure 2: Ring form of *Plasmodium vivax* with thrombocytopenia

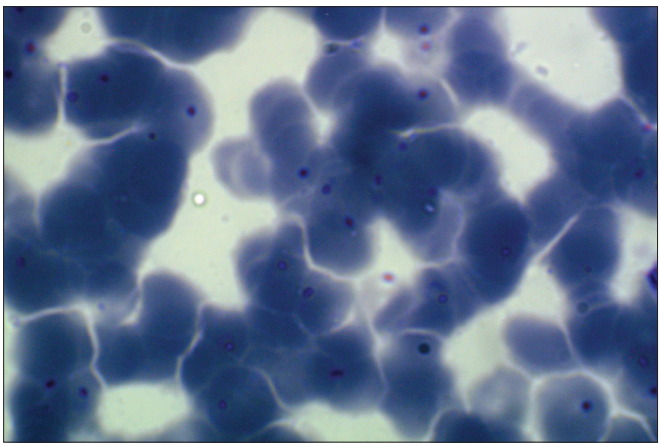

Figure 3: Ring form of *Plasmodium falciparum* with thrombocytopenia

destruction[18] as well as immune mechanism involving specific platelet associated IgG antibodies that bind directly to the malarial antigen in the platelets have been recently reported to play a role in the lysis of platelets and the development of thrombocytopenia.[19]

Although absence of thrombocytopenia is uncommon in malaria, its presence is not a distinguishing feature between the two types, because thrombocytopenia is associated with both *P. vivax* as well as *P. falciparum* also.

CONCLUSION

We can conclude that thrombocytopenia also associated with *P. vivax* infection and not limited up to *P. falciparum* infection.

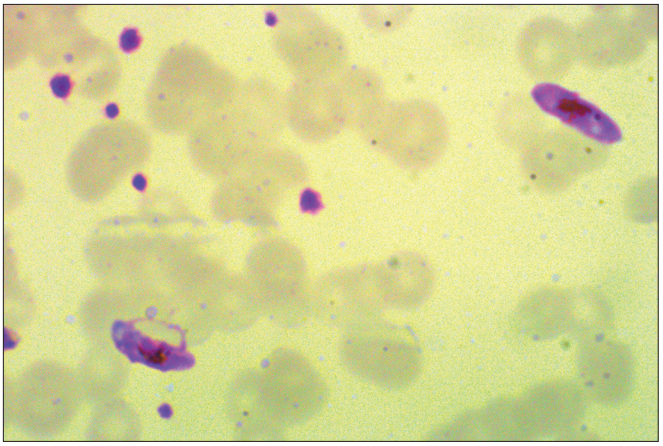

Figure 4: Gametocytes of *Plasmodium falciparum*

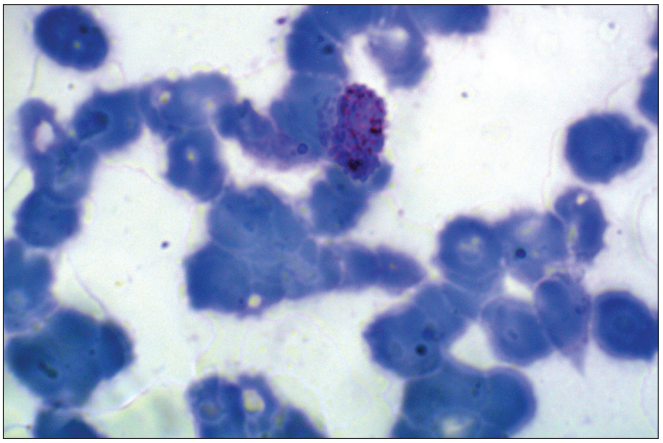

Figure 5: Schizont of *Plasmodium vivax* and ring form of *Plasmodium falciparum* (mixed infection)

Even though severe thrombocytopenia, platelet count below 50,000 per micro liter is also noted with *P. vivax* infection. We can also conclude that presence of thrombocytopenia is not a distinguishing feature between the *P. falciparum* and *P. vivax* infection. This study highlights the fact that in patients with acute febrile illness and with marked thrombocytopenia, *P. vivax* should also be kept as a differential diagnosis.

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