Association of Malaria with Thrombocytopenia

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In this study, 250 blood samples submitted for malaria investigation were studied microscopically for malarial parasites and platelet count. All samples were additionally analyzed for platelet count with automated haematology analyzer. Thirty seven (37) samples were found to be malaria positive microscopically. Out of 37 cases with malaria positive microscopically, thrombocytopenia was observed in 24 (64%) cases of malaria. So there is association of thrombocytopenia with malaria.

Key words: Malaria, thrombocytopenia, P. falciparum

300-500 million people are infected by malaria yearly[1] with the mortality rate of 1%[2]. It is epidemic and endemic in Africa, Central and South America, the Middle East and parts of Asia which have hot, humid environment which is ideal for breading of anopheles mosquito and is transmitted by the bite of infected female anopheles mosquito. It is also transmitted by blood transfusion, transplacentally and between drug addicts by reusing syringes[3].

Four species of plasmodia i.e. P. vivax, P.ovale, P. falciparum and P. malariae can cause malaria which is distinguishable on peripheral blood smear[4]. Plasmodium sporozoites are injected by the bite of female mosquito, reach liver, multiply there and released after 1-2 weeks to infect red cells. Severe cases of malaria are seen in falciparum infection. The severity of malaria may be determined by the magnitude of parasitaemia. The malaria is usually presented with febrile paroxysms, malaise and anemia[2]. The main hematological findings in patient's blood are anemia, thrombocytopenia, variable (low, normal, high) white cell (WBC) count, bleeding and parasitaemia[2,5]. Malaria is still common in oasis and costal areas of the Saudi Arabia. Expatriate work force also imports malaria from their home countries especially endemic areas of malaria[6].

Materials and methods:

Two hundred and fifty (250) adult subjects suspected of malaria were selected from Riyadh Medical Complex. Thirty seven (37) were found positive for malarial infection microscopically by thick and thin smears. Platelet counts were performed manually[7] as well as with automated hematology analyzer (Cell Dyn 3700). All slides were stained by Giemsa method[8]. Identification and level of parasitemia was done for each positive case[9].

Results:

In this study two types of plasmodium species, P. falciparum and P. vivax were found on thick and thin smear. There were 34(92%) cases of falciparum and 3(8%) cases of vivax. The comparison of positive and negative cases is given in Table 1

Five (20.1%) patients had platelet count less than 50×10^9/L, eleven (45.1%) had thrombocytopenia in the range of $50\text{-}100\times10^9$/L and eight (34.8%) had thrombocytopenia in the range of $100 - 150 \times 10^9$/L. Out of these five patients, three have parasitemia in the range of 3-10%. Maximum parasitemia was found to be 10% while 0.1% was the lowest. There were 8 (21.6%) patients who have parasitemia of 1% or above. These patients have platelet count of 60×10^9/L or less and this high parasitemia is inversely related to platelet count. A low platelet count was associated with high parasitaemia ($p<0.05$).

Table 1: Comparison of platelet count in malaria positive and negative cases with microscopy and hematology analyzer

Methods	Platelet count in malaria positive cases	Platelet count in malaria negative cases
Microscopy	117 ± 35.06	285.6 ± 41.01
Hematology analyzer	137 ± 48.13	292.3 ± 40.3

Discussion:

Thrombocytopenia is a well documented finding in falciparum malaria and in mixed falciparum/ vivax infection[11,12]. A platelet count less than 150×10^9/L was considered thrombocytopenia but is not associated with adverse outcome[13]. Thrombocytopenia is considered as an important indicator of malaria[14]. Maximum thrombocytopenia occurs on the fifth or sixth day of infection and gradually returns to normal within 5-7 days after parasitemia has ceased[15]. In the present study thrombocytopenia of less than 150×10^9/L was found in 24 (65%) of the malaria cases. Mean platelet count in P. falciparum infection was 141×10^9/L in hematology analyzer while on microscopy the mean platelet count was 120×10^9/L.

Thrombocytopenia has been observed in 60-80% of both P.falciparum and vivax infection[15]. The shortened life span of platelet is 2–3 days in comparison to 7- 10 days in normal controls[15,16]. The mechanism of thrombocytopenia in malaria is still unclear. Fajardo and Tallent[17] suggested a direct lytic effect of parasite on platelets. Both non-immunological destruction[18] and immunological mechanism involving platelet specific antibodies[19] have

been demonstrated. Mohanty et al[20] suggested that thrombocytopenia in malaria is partly immune mediated. During malarial infection, initial hyperactivity results in aggregation and later hypoactivity of platelets causes intravascular lysis. There is peripheral destruction and consumption of platelet in infected persons. Srichaikul[18] noted that despite thrombocytopenia, the number of megakarocytes in the bone marrow remained adequate or increased in malarial infection.

Scott et al[14] found that two third patients with parasitemia above 10% had platelet count < 50×10^{9}/L. Ladhani et al[13] found that a low platelet count is associated with parasite density but not with bleeding problem or mortility. Geradin et al[21] found an association between thrombocytopenia and either severity or prognosis in childhood falciparum. Low parasitemia may lead to the misdiagnosis of malaria and may delay the treatment[22]. Thus cases of pyrexia of unknown origin and thrombocytopenia should be investigated thoroughly for malaria.

Thus screening complete blood count can be a rapid and inexpensive yet valuable component in the diagnostic investigation of any patient, particularly the patient with pyrexia of unknown origin and thrombocytopenia.

References:

1. World Health Organization. World malaria situation in 1994.Wkly Rec 1997;72: 269-76.
2. Michael JGF. Infectious diseases, tropical medicine and sexually transmitted diseases. In: Clinical medicine Kumar P and Clark M (Ed). 4th ed 1998 London: WB Saunders.
3. Causer LM, Newman RD, Barber AM, Robert JM, Stennies G, Poland PB et al. Malaria surveillance- united states, 2002; 51(No.SS-5): 9-23.
4. Filler S, Causer LM, Newman RD, Barber AM, Robert JM, MacArthur J. Malaria surveillance- united states, 2001; 52(No.SS-5): 1-14.
5. Mohapatra MK, Mitra I, Das SP, Kar LK. Haematological and coagulation profile in malaria. The Indian Practitioner 2002; 55(2): 75-8.
6. Niazi GA. Hematological aspects of malaria in a population based hospital, Saudi Arabia. J Egypt Soc Parasitol 1995; 25(3):787-93.
7. Dacie JV, Lewis SM. Manual platelet count In: Dacie JV, Lewis SM(Ed).Practical Haematology 9th edn: Churchil Living Stone 1995
8. Dacie JV, Lewis SM. Preparation and staining methods for blood and bone marrow films. In: Dacie JV, Lewis SM(Ed). Practical Haematology 9th edn: Churchil Living Stone 1995:**81**.
9. Diagnostic procedures for blood specimens. Laboratory identification of parasites of public health concern. Diagnostic procedure. Centre for disease control and prevention. 22.6.2004. from http://www.dpd. Cdc.gov/dpdx/ diagnostic procedures,htm.
10. Crabbe G, Van Poucke M, Cantinieaux B. Artefactually normal automated platelet counts due to malaria infected RBC. Clin Lab Haematol 2002; 24(3):179-82.
11. Sharma SK, Das RK, Das BK, Das PK. Haematological and coagulation profile in acute falciparum malaria. J Assoc Phsicians India 1992; 40(9): 581-3
12. Makkkar RP, Mukhopadhyay S, Monga A, Gupta AK. Plasmodium vivax malaria presenting with severe thrombocytopenia. Braz J Infect Dis 2002; 6(5):263-5.
13. Ladhani S, Lowe B, Cole AO, Kowuondo K, Newton CR. Changes in white blood cells and platelets in children with falciparum malaria: relationship to disease outcome. Br J Haematol 2002; 119(3): 839-47.
14. Scott CS, Van Z D, Ho E, Ruivo L, Mendelow B, Coetzer TL. Thrombocytopenia in patients with malaria: automated analysis of optical platelet counts and platelets clumps with the Cell Dyn CD 4000 analyzer. Clin Lab Haematol 2002; 24(5):295-302.
15. Srichialkul, Pulket C, Sirisatepisan T, Prayoonwiwat W. Platelet dysfunction in malaria. South Asian J Trop Med Pub Health 1988:19;225-33.
16. Horstmann RD, Dietrich M, Bienzle U, Rasche H. Malaria induced thrombocytopenia. Blut 1981; 42(3):157-64.
17. Fajardo LF, Tallent C. Malarial parasite within human platelets. JAMA 1974; 229:1205.
18. Looareesuwan S, Davis JG, Allen Dl, Lee SH, Bunnag D, White NJ. Thrombocytopenia in malaria. Southeast Asian J Trop Med Public Health 1992; 23(1):44-50.
19. Yamaguchi S, Kubota T, Yamagishi T, Okamoto K, Izumi T, Takada M et al. severe thrombocytopenia suggesting immunological mechanism in two cases of vivax malaria. Am J Hematol 1997; 56(3):183-6.
20. Mohanty D, Marwaha N, Ghosh K, Sharma S, Garewal G, Shah S et al. Functional and ultra structural changes of platelets in malarial infection. Trans R Soc Trop Med Hyg 1988; 82 (3):369-75.
21. Geradin P, Rogier C, Ka AS, Jouvenncel P, Brousse V, Imber P. Prognostic value of thrombocytopenia in African children with falciparum malaria. Am J Trop Med Hyg 2002; 66(6): 686- 91.
22. Moulin F, Lesage F, Legros AH. Thrombocytopenia and plasmodium falciparum malaria in children with different exposure. Arch Dis Child 2003;88 (6): 540-1.