LEUCOCYTE COUNT AS A MARKER OF SEVERITY IN MALARIA

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ABSTRACT

Objective: To analyze if leucocyte count could aid the diagnosis of malaria and if it could help in judging the severity and thus the prognosis.

Material and Method: Out of 374 patients admitted to a tertiary hospital with history of fever, 100 subjects diagnosed with malaria were included for the study. Other causes of fever were excluded. Relevant hematological profile was done and patients were categorized to those with leucopenia (<4000cells/mm^3), leucocytosis (>11000cells/mm^3) and normal count. The results were compared by chi-square test (x^2).

Results: Of the 69 subjects with *vivax* malaria, 21.7% had leucopenia while 7.2% had leucocytosis and of the 31 subjects with *falciparum* malaria, 16.2% had leucopenia while 6.45% had leucocytosis. Presence of leucopenia particularly in vivax malaria was significantly associated with anemia ($p< 0.001$) and thrombocytopenia ($p<0.0027$) when compared to those having leucocytosis and those with normal leucocyte count.

Conclusion: Whether leucopenia can prove to be a predictor for vivax malaria needs further large scale studies. However we propose leucopenia may be considered along with anemia and thrombocytopenia in prognosticating, particularly *vivax* malaria.

Keywords: Malaria; leucocyte; anemia; thrombocytopenia; prognosis

1. INTRODUCTION

Malaria is the most prevalent parasitic infection in the world and it continues to pose a challenge in view of its resurgence in recent years. Malaria is endemic in tropics and has posed major health problems [1]. It has been seen that only 40% of the cases present with classic paroxysms of chills and rigor, fever and sweating [2]. High mortality is associated with higher parasite count, anaemia, low platelet count, jaundice and delay in diagnosis [3]. Hence early diagnosis is the key to effective management. Leucocytosis has been shown to correlate to severe malaria[4] and few studies have shown that quite a number of patients with malaria present with leucopenia[5,6,7]. However leucocyte count is not used as a prognostic marker. Tropical countries need a simple and reliable test to predict malaria early and thus prevent complications.

The present study attempts to find out if leucocyte count could aid in the diagnosis of malaria and if it could predict the severity and thus the prognosis.

2. MATERIALS AND METHOD

The present study is a tertiary hospital based prospective study done at K S Hegde Hospital in South Canara, Karnataka, India. Out of 374 patients screened for fever, 100 subjects were detected to have malaria.

2.1. Inclusion criteria: Malaria cases detected by Quantitative Buffy Coat method / peripheral smear and aged 18 yrs and above.

2.2. Exclusion criteria: Fever due to causes other than malaria were excluded with relevant investigations. Co-infections were also excluded. Those not willing for admissions, investigations and consent were excluded from this study.

The study was conducted after an *ethical clearance* and after taking patients *informed consent*.

All the patients underwent investigations in the form of complete haemogram, renal function test, liver function test, urine analysis and blood culture. Leucocyte count less than 4000

cells/mm^3 was considered as leucocytopenia and more than 11000cells/mm3 was considered as leucocytosis.

2.3 Criteria for severe malaria: Unexplained unarousable coma, anemia, serum creatinine > 3mg/dl, Adult respiratory distress syndrome, serum bilirubin >3mg/dl, hemoglobinuria, blood glucose <40mg/dl, platelet count <50000 celss/mm^3.

2.4.Statistical analysis: Analysis between various parameters was done by chi square test (X^2).

3. RESULTS

The study included 100 patients with malaria in the age group 18-75 years. Table 1 shows the Incidence was maximum in the age group 18-35 (65%). Subjects included 83% men and 17% women. Patients with mixed malaria were re-categorized based on predominant parasite species and the tally stood at 69% and 31% for Plasmodium vivax and P. falciparum respectively. The overall mean leucocyte count was 5852 cells/mm^3 and the mean for vivax and falciparum malaria was 5787 cells /mm^3 and 5997cells/mm^3 respectively. The difference was not statistically significant. 21% had leucopenia and 7% had leucocytosis while 72% had leucocyte count within normal range.

Table 1: Age wise distribution of malaria cases

AGE	18-25	26-35	36-45	46-55	>55
CASES	36	29	13	12	10

Of the 69 subjects with vivax malaria, 21.7% had leucopenia while 7.2% had leucocytosis and of the 31 subjects with falciparum malaria , 16.2% had leucopenia while 6.45% had leucocytosis.

32 subjects fulfilled the criteria for severe malaria [22 subjects i.e 32% of vivax malaria ,and 10 subjects i.e 32% of falciparum malaria). 11 patients(50%) out of 22 subjects with severe vivax malaria had leucopenia while 4.5% had leucocytosis and 44.5% had normal counts. Out of the 10 severe falciparum malaria , 40% had leucopenia while 20% had leucocytosis and 40% had normal counts. Presence of leucopenia particularly in vivax malaria was significantly associated with anemia(p< 0.001) and thrombocytopenia (p<0.0027) when compared to those having leucocytosis and those with normal leucocyte count(Table 2).

Table 2: Comparison between various leucocytes counts in *vivax* malaria and severity

Severity	*Vivax* Malaria (n=69)				
	Leucopenia (16)	Leucocytosis (5)	Normal leucocyte count (48)	X^2 chi-square test	P valve
Anaemia	9	0	4	19.27	<0.001 vhs
Jaundice	6	2	7	4.76	0.092 ns
Thrombocytopenia	8	0	6	11.81	0.0027 hs
Cerebral Malaria	2	0	0	-	-
ARDS	1	0	0	-	-
Renal failure	2	0	0	-	-
Death	1	0	0	-	--

Vhs- very highly significant, hs- highly significant, ns- no significance

It was also worth noting that other complications like cerebral malaria, adult respiratory distress syndrome(ARDS) , renal failure and death was associated with leucopenia, though significance could not be established. Similar findings was not seen with falciparum malaria (Table 3).

Table3: Comparison between various leucocyte count in falciparum malaria and severity

Severity	Falciparum Malaria (n=31)		
	Leucopenia (5)	Leucocytosis (2)	Normal leucocyte count (24)
Anaemia	3 (60%)	2 (100%)	5 (20.8%)
Jaundice	0	2 (100%)	5 (20.8%)
Thrombocytopenia	2 (40%)	1 (50%)	5 (20.8%)
Renal failure	1 (20%)	1 (50%)	1 (4.2%)

4. DISCUSSION:

Although the etiology has remained the same and there are newer drugs coming up, the incidence and mortality seems to be rising due to delay in diagnosis. There are various hematological changes in malaria. Thrombocytopenia followed by combination of thrombocytopenia and anemia are two best parameters to predict malaria[8]. According to the Study by Lathia[8], leucocyte count was not a reliable parameter albeit in another study leucopenia was associated with poor outcome[3]. Leucopenia is the result of localization away from the peripheral circulation and in the spleen whereas leucocytosis is probably secondary to co-infection[7]. In the present study leucopenia was more common with vivax malaria as against the various other studies were it was more common with falciparum malaria [5,6,7]. Severe malaria in the form of anemia and thrombocytopenia was significantly associated with leucopenia , particularly in vivax malaria. ARDS, renal failure and death was seen only with vivax malaria with leucocytopenia, though statistically insignificant. Leucocytosis was not a common finding probably because co-infection cases were excluded from this study. Also there was no significant association between severe malaria and leucocytosis because of the limited number of subjects in this group.

In conclusion whether leucopenia can prove to be a predictor for vivax malaria needs further large scale studies. However we propose leucopenia may be considered along with anemia and thrombocytopenia in prognosticating particularly *vivax* malaria.

REFERENCES

1. White NJ, Brenan JG. Malaria. In : Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, et al. Harrison's principle of internal medicine. 17th ed. New York: McGraw Hill; 2008. p. 1280-94.
2. Hazra BR, Chowdhury RS, Saha SK, Ghosh MB, Mazumder AK. Changing scenario of malaria: a study at Calcutta. Indian J Malariol 1998; 35(2): 111-6.
3. Patel U, Gandhi G, Friedman S, Niranjan S. Thrombocytopenia in malaria. J Natl Med Assoc 2004; 96(9): 1212-4.
4. Modiano D, Sirima BS, Konate A, Sanou I, Sawadogo A. Leucocytosis in severe malaria. Trans R Soc Trop Med Hyg. 2001; 95:175-6.
5. Tangpukdee N, Yew HS, Krudsood S, Punyapradit N, Somwong W, Kano S, et al. Dynamic changes in white blood cells in uncomplicated plasmodium falciparum and vivax malaria. Parasitol Int. 2008; 57(4):490-4.
6. Mckenzie FE, Prudhomme WA, Magill AJ, Forney JR, Permpanich B, Lucas C, et al. White blood cell count and malaria. J Infect Dis 2005;192(2);323-30.
7. Jadhav UM , Singhvi R , Shah R. Prognostic Implication of white cell differential count and white cell morphology in malaria. J Postgrad Med 2003;49:218-21.
8. Lathia TB, Joshi R. Can hematological parameters discriminate malaria from non malarious acute febrile illness in tropics. Indian J Med Sci 2004;58:239-44.