Original Article

Impact of splenomegaly on complete blood counts in hospitalized patients with Plasmodium vivax malaria

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Objective: To determine the effects of Plasmodium vivax infection on blood counts and the impact of splenomegaly on these results.

Methodology: This was a retrospective observational study carried out at 1 Mountain Medical Battalion, Bagh, Azad Kashmir. Medical records of all patients admitted with vivax malaria from January 2010 to October 2012 were reviewed. The presence or absence of a palpable spleen and the results of complete blood counts measured at the time of admission were noted. Anemia was defined as Hb<13g/dl in men, leukopenia as total leukocyte count (TLC)<4000/µl and thrombocytopenia as platelets count <150000/µl. Data was analysed with STATA version 12.1.

Results: Anemia was seen in 22.15%, neutropenia in 23.49% and thrombocytopenia in 90.60% of the 149 male patients having a mean age of 27.54±5.11 years. The differences in mean blood counts and the number of patients with hematological abnormalities in the two groups were statistically insignificant.

Conclusion: Since the blood counts are not affected by presence or absence of splenomegaly, mechanisms other than hypersplenism are important. (Rawal Med J 2013;38: 223-225).

Key words: Anaemia, leukopenia, thrombocytopenia, malaria, splenomegaly.

INTRODUCTION

Malaria is a major public health problem in many developing countries like Pakistan. Around 100 million people out of the estimated 3 billion at-risk individuals acquire vivax malaria every year.[1] It is now being increasingly recognized that the *P. vivax* malaria can produce serious manifestations just like falciparum malaria.[2] More commonly, significant changes in hematological parameters exist even during the initial phase of clinical infection. This study was carried out to determine the impact of *P. vivax* infection on complete blood counts including platelets in our patient population and to assess whether the presence of splenomegaly had any influence on these laboratory parameters.

METHODOLOGY

This retrospective observational study was carried out at the Department of Medicine, 1 Mountain Medical Battalion, Bagh, Azad Kashmir. All patients admitted from January 2010 to October 2012 and diagnosed to have *P. vivax* malaria based on peripheral blood smear were included. Patients with falciparum malaria/ mixed falciparum and vivax malaria as well as those with malaria diagnosed only on the basis of clinical suspicion were excluded from the study. Medical records of all eligible patients were reviewed. Apart from demographic features, duration of illness and the presence or absence of a palpable spleen at the time of admission were noted down. The results of complete blood counts and platelet counts measured on the first day of admission with a Sysmex KX 21 Haematology Analyzer were also recorded.

Anemia was defined as Hb<13g/dl in men, leukopenia as TLC<4000/µl and thrombocytopenia as platelets count <150000/µl. Data was analyzed with STATA version 12.1. The results of hematology parameters were compared amongst patients with splenomegaly and those without splenomegaly using student's t-test. Chi square test was used to compare proportions of patients having different hematological abnormalities.

RESULTS

One hundred and forty nine patients were included

in this study. All were males with mean age of 27.54±5.11 years and fever for 3.15±1.77 days at the time of admission.

Table 1. Comparsion of patients with hemtological abnormalities.

Parameter	Patients with splenomegaly (n=48)	Patients without splenomegaly (n=101)	Total	P
Anemia	14 (29.17%)	19 (18.81%)	33	0.155
Leukopenia	7 (14.58%)	28 (27.72%)	35	0.077
Thrombocytopenia	46 (95.83%)	89 (88.12%)	135	0.132

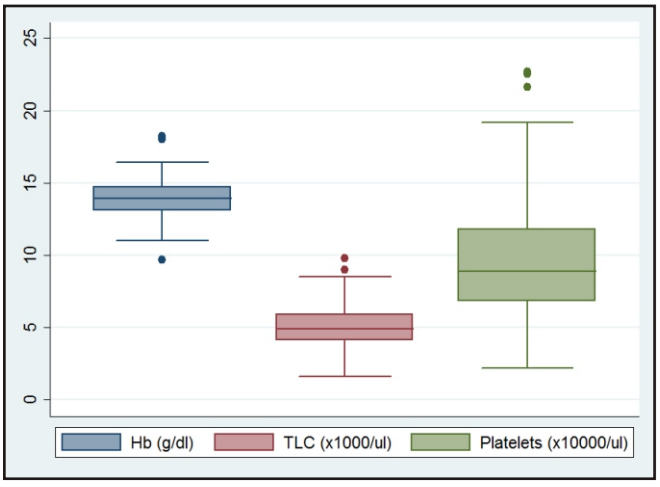
Out of these, 48 had splenomegaly at the time of admission. The results of hematological parameters are shown in Fig 1.

Table 2. Parameters compared between the two groups.

Parameter	Patients with splenomegaly	Patients without splenomegaly	p
Hb (mg/dl)	13.64±1.56	13.90±1.23	0.263
TLC (/ul)	5285.42± 1558.23	4987.13± 1547.04	0.274
Platelets (/ul)	87416.67± 32114.71	99485.15± 42519.79	0.083

Anemia was seen in 33(22.15%), neutropenia in 35(23.49%) and thrombocytopenia in 135(90.60%) patients (Table 1).

Fig 1. Haematological parameters on admission.

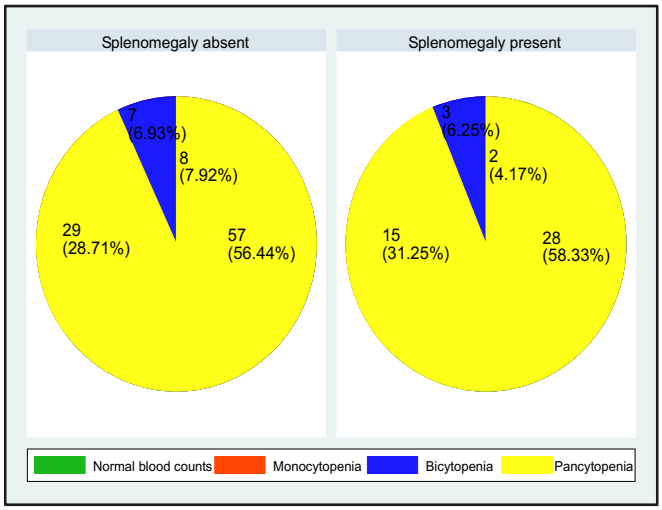


Many patients had more than one hematological abnormality (bi- and pancytopenia). Their proportions are displayed in Fig 2. As shown in Table 2, there was no difference in the hematological parameters amongst patients with splenomegaly and those without it.

DISCUSSION

Our hospital is a 50-bedded field medical setup of Pakistan Army. Being a small outfit, only serving soldiers are admitted for indoor treatment. For this very reason, only young male patients were included in this study. Though vivax malaria is generally a benign and easily treatable disease, there has been a trend towards increased incidence of complications in the recent years.[3] Moreover, there is a need to avoid undue physical activity during the acute febrile phase. So, we generally treat all of our serving troops indoors with a primary aim to provide them bed rest.

Fig 2. Patients showing various combinations of haematological abnormalities



Thrombocytopenia was the most common abnormality. Though lower frequencies are generally described in local literature, there are a few studies with nearly similar results. For example, thrombocytopenia was seen in 93.3% cases in a study done at Karachi.[4] Similarly, 89% patients with vivax malaria had thrombocytopenia in a study published in 2010.[5] Results close to this have been published internationally as well- thrombocytopenia was seen in 86% of patients in a study done in Qatar.[6]

There are several mechanisms for the development of thromocytopenia in patients with vivax malaria. Although a dyspoetic mechanism used to be cited in the literature in the past, a recent article by Lacerda et al disapproves direct bone marrow supression by the malarial parasites as a potential cause.[7] Since platelets as well as other blood counts were the same in patients with and without a clinically palpable slpeen, hypersplenism is at least not the only or the most important reason.

It is not the actual depletion of leukocytes but the shifting away from the peripheral blood vessels into the spleen and other marginal pools that reduces the white cell counts in vivax malaria.[8] Leukopenia was seen in 15.2% patients in an Indian study and in 14% in a study from Dubai.[9,10] These figures are lower than ours. The results of blood counts depend on the number of days that have elapsed since the onset of illness. One possibility of higher degree of leukopenia in our patients would be a relatively late presentation. However, studies done in Pakistan give nearly similar statistics e.g. 21.5% during 2006-07 in Karachi.[11]

The frequency of anemia seen in our patients is comparable to other studies done in Pakistan. Two studies from Quetta, a hub for vivax malaria, found anemia in 25 and 29.5%.[12,13] Splenomegaly is a recognized risk factor for anemia in vivax malaria but in our patients, the Hb levels did not differ statistically in the two groups. This highlights the importance of others mechanisms involved in the pathophysiology of anemia. These include dyserythropoiesis and bone marrow insufficiency besides intravascular hemolysis of RBCs before being phagocytosed in the spleen.[2]

Since this study is retrospective and relied on medical records, we do not have any information on the follow up of patients after discharge from the hospital. Thus, we are not sure whether anemia in all the individuals was due to infection with P. vivax or due to some other cause identified later.

CONCLUSION

P vivax infection frequently produces abnormalities in blood counts, thrombocytopenia being the most common. Hypersplenism is not the only mechanism for these abnormalities.

Author Contributions:
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Analysis and interpretation of the data: Abdul Rehman Arshad, Abdullah Arshad
Drafting of the article: Abdul Rehman Arshad
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Conflict of Interest: None declared.
Rec. Date: Nov 13, 2012 Accept Date: Mar 20, 2013

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