MALARIA;

Assessment of haematological changes

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ABSTRACT... Objectives: To see the effects of malaria infection on platelet count and haemoglobin in children suffering from malaria. **Design:** Descriptive study. **Setting:** CMH Okara and CMH Pano Aqil Cantt. **Period:** July 2008 to June 2012. **Methodology:** Children admitted with fever of less than seven days duration who had positive smear for malaria parasite were included in the study. After detailed history and thorough examination, patients were investigated to find out the cause of fever. All the patients with localizing cause for fever and history of drug intake were excluded. All patients were investigated with complete blood counts and serial peripheral smears for malaria parasite. Peripheral blood smear examination for malarial parasite was taken as gold standard for the diagnosis of malaria. Cut off value for low hemoglobin (anemia) was taken as 10gm/dl and platelet count of less than $150x10^9$/L, was used to define thrombocytopenia. Patients with thrombocytopenia were divided in to three categories. Mild thrombocytopenia was defined as patients with platelet count of $<50x10^9$/L to $>150x10^9$/L, moderate thrombocytopenia included patients with platelet counts of $<20x10^9$/L to $>50x10^9$/L and severe thrombocytopenia consisted of patients with platelet counts of $<20x10^9$/L. **Results:** A total of one hundred and fourteen smear positive patients were analyzed, out of which 93% had low and 7% had normal platelet count. 95% had Vivax and only 5% had Falciparum malaria. Mean platelet count was $87x10^9$/L. Mean platelet count in Falciparum was $42x10^9$/L whereas it was $88 x10^9$/L in Vivax malaria. Sixty two (54%) patients had anaemia. Mean haemoglobin was 9.54gm/dl. Mean Hb in Falciparum malaria was 7.5gm/dl and in Vivax it was 9.6gm/dl. **Conclusions:** Higher frequency of mild to moderate thrombocytopenia and anaemia was observed in hospitalized children suffering from malaria. Plasmodium Vivax was found to be the most common species.

Key words: Thrombocytopenia, Anaemia, Malaria, Children

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INTRODUCTION

Malaria remains a global health problem with an estimate of 3 billion people at risk of infection in 109 malaria endemic countries. Approximate 250 million cases occur annually leading to approximately one million deaths. Plasmodium Falciparum was among the leading cause of death. 1.2 billion people live in areas with a high risk of malaria (more than 1 reported case per 1000 population per year). There were an estimated 247 million malaria cases among 3.3 billion people at risk in 2006, causing nearly a million deaths, mostly of children under 5 years[1].

Although infection due to Plasmodium falciparum is responsible for the greatest overall morbidity and mortality, P. vivax contributes seventy to eighty million new cases to the annual worldwide burden of disease, especially in temperate regions[2]. Over 40% of world population lives in malaria endemic area including Southeast Asia, India, Pakistan, Bangladesh, Africa, areas of Middle East and Central and South America[3].

Malaria has been a persistent problem in Pakistan with an estimate of 1.5 million malaria episodes in 2006 out of which 30% were due to Plasmodium Falciparum1. Pakistan being a part of endemic belt has an incidence of one case per thousand population[4,5]. Severe malaria has been a major cause of mortality worldwide and Plasmodium Falciparum is the main species for most of these deaths[6].

Clinically malaria mimics many diseases and there are no absolute diagnostic clinical features. It has been observed that patients suffering from malaria show hematological abnormalities specially anemia and thrombocytopenia[7]. The low platelet count emerged as the strongest predictor of malaria[8]. Various studies have found thrombocytopenia to be commonly

associated with malaria[9,10,11,12], which resolves after therapy[13].

This study was carried out to see the effects of malaria infection on platelet counts in children.

METHODOLOGY

This descriptive study was carried out at CMH Okara and CMH Pano Aqil Cantt from July 2008 to Jun 2012. Children admitted with fever of less than seven days duration who had positive smear for malarial parasite were included in the study. A detailed history was taken and thorough examination was performed to find out the cause of fever. All the patients with localizing cause for fever were excluded. Patients with clinical features suggesting chronic liver disease, those with history of bleeding disorder, thrombocytopenia or purpura and those with history of drug intake such as fansidar, sulpha drugs, thiazides and chemotherapeutic agents were also excluded.

All patients were investigated with complete blood counts and serial peripheral smears for malarial parasite on admission and at spike of fever. Thick and thin smears were stained with Leishman stain and studied by consultant pathologist. To find out other causes of fever, X-Ray Chest, blood culture, serology for Salmonella and urine microscopy were done. Serum chemistry (electrolytes, creatinine and liver enzymes) was done on Microlab 200 Merck chemistry analyzer. In addition cerebrospinal fluid examination and culture, urine culture, abdominal and brain imaging were done where indicated.

Peripheral blood smear examination for malarial parasite was taken as gold standard for the diagnosis of malaria. The complete blood counts were done with an automated haematology analyzer Sysmex KX21 and peripheral smears were examined by a qualified pathologist. Pathologist was blinded to the automated hematology analyzer results. Two hematological parameters, hemoglobin and platelet count were taken as index tests. Cut off value for low hemoglobin (anemia) was taken as 10gm/dl and platelet count of less than $150x10^9$/L, was used to define thrombocytopenia. Those with reduced platelet count were re-evaluated by manual method.

Patients with thrombocytopenia were divided in to three categories. Mild thrombocytopenia was defined as patients with platelet count of $<150x10^9$/L to $>50x10^9$/L, moderate thrombocytopenia as patients with platelet counts of $<50x10^9$/L to $>20x10^9$/L and severe thrombocytopenia as patients with platelet counts of $<20x10^9$/L.

RESULTS

A total of One hundred and fourteen (114) Malarial Parasite (MP) smear positive patients were analyzed, out of which 106(93%) had low and only 08(7%) had normal platelet count. Ninety two patients (81%) had mild, 14(12%) moderate and none had severe thrombocytopenia. (Table I).

Platelet count x 10^9/L	No. of patients	%age
<20	-	-
20-50	14	12
50-150	92	81
>150	08	07

Table-I. Platelet counts in patients with malaria (n = 114)

One hundred and eight (95%) had Vivax and only 06(5%) had Falciparum malaria. All cases with Falciparum malaria and only 08 patients of Vivax had moderate thrombocytopenia. (Table II) Mean platelet count was 87x109/L (Normal 150-400x109/L). Maximum platelet count was 187x109/L and minimum count was 32x109/L. Mean platelet count in Falciparum was 42x109/L whereas it was 88x109/L in Vivax malaria.

	No. of Patients	<20x10^9/L	20-50x10^9/L	50-150x10^9/L	>150x10^9/L
Plasmodium Falciparum	06	-	06	-	-
Plasmodium Vivax	108	-	08	92	08

Table-II. Platelet Counts in Vivax and Falciparum malaria

Sixty two (54%) patients had anaemia. Mean haemoglobin (Hb) was 9.54gm/dl whereas maximum Hb was 14.6gm/dl and minimum Hb was 6.0gm/dl. Mean Hb in Falciparum malaria was 7.5gm/dl and in Vivax it was 9.6gm/dl.

DISCUSSION

Malaria is one of the common causes of acute febrile illness in our country but the clinical diagnosis is often difficult. Hematological abnormalities are common. Thrombocytopenia occurs in 60-80%[14] and anemia in 25%[15]. Finding of thrombocytopenia with anemia is an important clue to the diagnosis of malaria in patients suffering from acute febrile illness[16].

The cause of thrombocytopenia is poorly understood, although increased platelet destruction is significant and platelet lifespan is reduced during malaria. The suggested mechanisms for thrombocytopenia include disseminated intravascular coagulation or excessive removal of platelets by reticulo-endothelial system[17]. Anti-Platelet IgG antibodies have also been implicated in the pathogenesis of thrombocytopenia[18]. Thrombocytopenic malaria, in contrast to the non-thrombocytopenic variety correlates with a higher degree of parasitemia and increased cytokine production[19,20].

In this study 93% of patients suffering from malaria showed some degree of thrombocytopenia. This figure is consistent with the results of the studies done by other investigators as 71% by Robinson[21], 69% by Shuaib Ansari et al[22] and 58.97% by Rodriguez et al[23]. Similar results were found in another study from Pakistan[24]. However some studies have shown relatively low percentage, 35% by Climent et al[20].

Thrombocytopenia is considered to be an important predictor of severity in childhood Falciparum malaria[25]. It was observed that mean platelet count was lower (42x10^9/L) in Falciparum as compared to Vivax malaria (84x10^9/L). Mean haemoglobin was also less in Falciparum as compared to Vivax malaria. However severe thrombocytopenia was not observed in this study as compared to Shuaib et al[22] who found severe thrombocytopenia in 10% of their patients. Thrombocytopenia together with anemia was found in 54% of cases in this study. Bashwari et al from Saudi Arabia has reported anemia in 60% and thrombocytopenia in 53%[26]. Similar results were also found by AlfonsoJ et al[27] in their study.

Thrombocytopenia is seen in patients with acute febrile illness due to viral causes as well but its presence is considered as an important diagnostic clue for malaria in endemic areas as suggested by other investigators[28] and particularly so when associated with anemia[29]. Hence patients with acute febrile illness without localizing signs and having combination of anemia and thrombocytopenia should alert the treating physician about the possibility of malaria infection which can be confirmed with specific tests like smears for malarial parasite and immuno chromatographic technique (ICT).

CONCLUSIONS

Higher frequency of mild to moderate thrombocytopenia and anaemia was observed in hospitalized children suffering from malaria. Plasmodium Vivax was found to be the most common species in these cases. Finding of thrombocytopenia is of diagnostic help as it raises the suspicion of

malaria and is helpful in diagnosing and treating these patients as outdoor thus reducing financial burden of the patients and the hospital.

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