ANEMIA AND THROMBOCYTOPENIA IN MALARIA: AN OBSERVATIONAL STUDY OF 115 PATIENTS IN MARDAN, KPK, PAKISTAN

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ABSTRACT

Background and Objectives: Malaria is associated with high mortality and morbidity. Pakistan is among the countries having a high infectivity rate of malaria. Active malarial transmission takes place throughout the year, while aggressive out bursts of disease are seen mainly during and after the 'monsoon' season. The aim of present study was to evaluate the hematological changes in malaria in Mardan, KPK. This was observational, cross sectional study. The study was conducted in at outpatient department of BKMC/MMC hospital Mardan from July to September 2015.

Methods: A total of 115 patients were divided to age groups of < 15 and > 15 years old. Approval of the study was taken from Hospital Ethical Committee and informed written consent was taken from each patient prior to include in the study. All patients with fever with "no focal signs on history and clinical examination" were included in the study. Blood smear slide for MP were advised for those patients with fever with no focal signs. All patients with fever but negative for blood smear slide for MP were excluded from the study. Both thick and thin films were prepared examined. Those patients with a confirmed diagnosis of malaria were investigated for platelets, hemoglobin and total leukocyte count on automatic hematology analyzer (Mindray) and studied by hematologist. SPSS 20 was used for statistical analysis.

Results: Out of total 115 patients; males were 56 (48.7%) and females 59 (51.3%) and mean age of study group was 10.62 ±3.89. According to age group; patients < 15 years comprised of 102 (88.7%), while > 15 years were found 13 (11.3%). P. vivax was seen in 108 (93.9%) and P. falciparum 7 (6.1%) patients. Out of total population 70 (60.9%) were found anemic, 79 (68.7%) had mild thrombocytopenia and 4 (3.5%) with moderate thrombocytopenia and sever leucopenia were found 2 (1.7%), mild leucopenia 24 (20.9%), mild leucocytosis 1 (0.9%). Patients with P. vivax aged < 15 years had anemia 59 (62.1%) with p = 0.56, moderate thrombocytopenia 4 (4.2%) (p = 0.05), sever leucopenia 2 (2.11%), mild leucopenia 13 (13.7%) and mild leukocytosis 1 (1.1%) with p = 0.001.

Conclusion: The present study concludes that thrombocytopenia and anemia are common hematological findings in patient with Plasmodium infection particularly vivax species infection in Mardan region. Therefore, malaria should be a consideration in febrile patients with low platelets and haemoglobin.

Keywords: Malaria, anemia, leucocyte, thrombocytopenia.

INTRODUCTION

Malaria is a febrile illness, caused by Malarial plasmodium parasite. It results from the bite of female anaphelen mosquito. The mosquito inoculates sporozoites in human blood which consequent upon clinical symptoms after a specific incubation period.[1] Malaria is caused by four species of Plasmodium; Plasmodium vivax, Plasmodium falciparum, Plasmodium ovale and Plasmodium malariae.[2]

A global survey of World Health Organization reveals that about 40% of population is at risk of malaria. Approximately 300 – 500 million people of the world are infected with this parasite.[3] About 2 million people die due to malaria and its complications per anum.[4] Africa has the highest mortality, where children are mainly affected. The worldwide fatality rate of malaria is 10 – 30%.[5] Malaria results in the loss of 35,728000 disability adjusted Life Years revealing the worldwide impact of this disease.[6] The disease affects mostly tropical areas of the world; Sub-Saharan Africa to a lesser extent Southeast Asia, South Africa, Pacific Islands, India, Central and South America. Pakistan is amongst the highly affected countries regarding infectivity rate of malaria. Though Malaria is actively transmitted round the year, in the 'moonsoon' its aggressive outbreaks occur.

Hemolysis in malaria leads to anemia, altering the hemopoiesis, to a disproportionate reticulocytes cou-

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nts, reduced platelets and WBC counts. Malaria is commonly associated with mild to moderate thrombocytopenia which is rarely associated with hemorrhagic outcomes or disseminated intravascular coagulation.[7,8] Thrombocytopenia may occur in majority of malaria cases, laboratory variance related with malaria are well identified but it may change with type, level of immunity, demographic factors and malaria endemicity.[9,10] The purpose of this study was to assess and evaluate hematological changes in malaria in Mardan, KPK Pakistan.

PATIENTS AND METHODS

Design: This was prospective cross – sectional study.
Place and Duration of Study: The study was conducted in at outpatient department of BKMC/MMC hospital Mardan from July to September 2015.

Approval of the study was taken from hospital Ethical Committee and informed written consent was taken from each patient prior to include in the study. A total of 115 patients were divided to age groups of < 15 and > 15 years old. All patients with fever and "no focal signs on history and clinical examination" were included in the study. Blood smear slide for MP were advised for those patients with fever with no focal signs. All patients with fever but negative for blood smear slide for MP were excluded from the study. Both thick and thin films were advised to the patients. Those patients with a confirmed diagnosis of malaria were investigated for platelets, hemoglobin and total leukocyte count on Automatic hematology analyzer (Mindray) and studied by hematologist. SPSS 20 was used for statistical analysis.

According to hemoglobin level, two groups were classified as group A having hemoglobin < 10 gm/dL and group B hemoglobin > 10 gm/dL. The normal range of leukocytes was taken as 4000 – 11000/cmm, any deviation from this limit was noted as abnormal. Thrombocytopenia was classified as mild thrombocytopenia (Plat 50 – 150 × 103 cells/ul), moderate (Plat 20 – 50 × 103 cells/ul) and severe thrombocytopenia (Platelets < 20 × 103 cell/ul).[11] SPSS 20 was used for statistical analysis.

RESULTS

A total of 115 patients were included in the study. Male were 56 (48.7%) and females 59 (51.3%), the mean age of study group was 10.62 ± 3.89. According to age group, patients were divided into two groups; those < 15 years comprised of 102 (88.7%), while > 15 years were found 13 (11.3%) (Table 1). P. vivax was seen in 108 (93.9%) and P. falciparum 7 (6.1%) patients. According to laboratory findings; out of total population 70 (60.9%) were found anemic, 79 (68.7%) had mild thrombocytopenia and 4 (3.5%) with moderate thrombocytopenia and sever leucopenia were found 2 (1.7%), mild leucopenia 24 (20.9%), mild leucocytosis 1 (0.9%) (Table 2). According to the type of malaria and age group; patients with P. vivax aged < 15 years had found anemia 59 (62.1%) p = 0.56, moderate thrombocytopenia 4 (4.2%) (p = 0.05), sever leucopenia 2 (2.11%), mild leucopenia 13 (13.7%) and mild leukocytosis 1 (1.1%) p = 0.001. Patients with P. vivax and age > 15 years had found; anemia 7 (53.8%), mild thrombocytopenia 6(46.2%) and mild leucopenia 8 (61.5%) (Table 3).

Table 1: *Age and sex distribution n = 115.*

Sex	*Frequency*	*Percent %*
Male	56	48.7
Female	59	51
Age < 15 years	102	88.7
Age >15 years	13	11.3
Total	115	100

Table 2: *Laboratory profile n = 115.*

Variable	*Frequency*	*Percent %*
Hb		
Anemia	70	60.9
No anemia	45	39.1
Plateletes		
Normal	32	27.8
Mild thrombocytopenia	79	68.7
Moderate thrombocytopenia	4	3.5
TLC		
Sever leucopenia	2	1.7
Mild leucopenia	24	20.9
Mild leucocytosis	1	0.9

Patients with P. falciparum malaria aged < 15 years had anemia 4 (57.1%) with p = 0.48, mild thrombocytopenia 4 (57.1%) and mild leucopenia 1 (25%) and patients with age > 15 years had anemia 4 (57.1%), mild thrombocytopenia 4 (57.1%) and mild leucopenia 3 (42.9%) with p = 0.37 (Table 3).

DISCUSSION

The hematological changes related with malaria are familiar, but precise changes may vary with category of malaria, with the background of hemoglobinopathy, nutritional status, demographic factors and malaria immunity.[12] In present study, the frequency of P. vivax was higher 108 (93.9%) as compared to P. falciparum

Table 3: *Lab. Profile of P. vivax, P. falciparum according to age group.*

Malaria		*Age Group* < 15 years n = 102	> 15 years n = 13	*Total*	*P-value*
P. Vivax n= 108 Hb	Anemia	59 (62.1%)	7 (53.8%)	66 (61.1%)	0.56
	No Anemia	36 (85.7%)	6 (14.3%)	42 (38.9%)	
Platelets	Moderate thrombocytopenia	4 (4.2%)	0 (0.0%)	4 (3.7%)	0.05
	Mild thrombocytopenia	69 (72.6%)	6 (46.2%)	75 (69.4%)	
	Normal platelets	22 (23.2%)	7 (53.8%)	29 (26.9%)	
TLC	Sever leucopenia	2 (2.11%)	0 (0.0%)	2 (1.9%)	0.001
	Mild leucopenia	13 (13.7%)	8 (61.5%)	21 (19.4%	
	Normal	19 (94.0%)	5 (38.5%)	84 (77.8%)	
	Mild leukocytosis	1 (1.1%)	0 (0.0%)	1 (0.9%)	
	Moderate leukocytosis	Nil	Nil	Nil	
	Sever leukocytosis	Nil	Nil	Nil	
P. Falciparum n = 7 Hb	Anemia	4 (57.1%)	Nil	4 (57.1%)	0.48
	No Anemia	3 (25%)	Nil	3 (42.9%)	
Platelets	Moderate thrombocytopenia	Nil	Nil	Nil	
	Mild thrombocytopenia	4 (57.1%)	Nil	4 (57.1%)	
	Normal platelets	3 (42.9%)	Nil	3 (42.9%)	0.37
TLC	Sever leucopenia	Nil	Nil	Nil	
	Mild leucopenia	1 (25%)	2 (66.7%)	3 (42.9%)	
	Normal	3 (75%)	1 (33.3%)	4 (57.1%)	
	Mild leukocytosis	Nil	Nil	Nil	
	Moderate leukocytosis	Nil	Nil	Nil	
	Sever leukocytosis	Nil	Nil	Nil	

7 (6.1%). A study conducted by Bega et al, in a tertiary care hospital in Karachi which showed P. vivax in 52% and P. falciparum in 46% of patients with acute malaria.[13] In other study, Jalaluddin et al, showed a higher frequency of P. falciparum as compared to P. vivax (65% vs. 35%) in children.[14]

Present study reported thrombocytopenia out of the total population was 79 (68.7%) as mild and 4 (3.5%) as moderate thrombocytopenia. In cases of P. vivax and age > 15 years reported moderate thrombocytopenia 6 (46.2%) and in P. falciparum it was 4 (57.1%). A study conducted by Qurban et al, reported 93.33% of thrombocytopenia in patients having Plasmodium vivax.[15] In contrast to our study Jadhav and Patkar conducted an extensive study regarding pattern of thrombocytopenia in patients having vivax and falciparum malaria. They documented thrombocytopenia in both groups of patients but severe thrombocytopenia, (platelets 20,000 or less) was more consistent with Plasmodium falciparum malaria, while Memon has reported thrombocytopenia in malaria to be about 70%.[16,17]

Present study reported 79 cases of (68.7%) anemia out of total studied population, of which 59 (62.1%) anemic cases were < 15 years old and 7 (53.8%) < 15 years age group. Anemia was also reported in 56.45% of malaria patients by Qurban et al, as another hematological indicator.[15] Some observers have suggested that malaria-related anemia is more severe in the areas of intense malaria transmission and in younger children rather than older children or adults.[18] The hemoglobin changes observed in this study population may reflect a higher prevalence of underlying anemia, poor nutritional status and non-availability of proper treat-

ment.

Present study found sever leucopenia in 2 (1.7%), mild leucopenia in 24 (20.9%) and mild leucocytosis in 1 (0.9%) of the total studied population. According to type of malaria and age group, P. vivax infected patients with age less than 15 years had sever leucopenia 2 (2.11%), mild leucopenia 13 (13.7%) and mild leucocytosis 1 (1.1%), and in patients > 15 years old had mild leucopenia 8 (61.5%). Patients of P. falciparum with age < 15 years had mild leucopenia 1 (25%) and with age > 15 years had mild leucopenia 3 (42.9%).

Leucopenia is thought to be due to the localization of leucocytes away from peripheral circulation, splenic sequestration and other marginal pools rather than actual depletion or stasis.[19]

It is ***concluded*** that thrombocytopenia and anemia were familiar hematological changes in patient with Plasmodium infection notably observed in plasmodium vivax species. Therefore, malaria should be a deliberation in febrile patients with low haemoglobin and platelets. Patients with acute febrile illness having association of anaemia and thrombocytopenia should alert the treating physician concerning the likelihood of malaria infection which may be confirmed with specific tests.

Conflict of Interest: None.

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Author's Contribution
A. J. and J. A. helped in data collection, U. A. in study design, critical review. K. U. and F. S. in drafting manuscript and data interpretation and W. A. approving final version of manuscript.

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