

Thrombocytopenia and anemia in malaria: an assessment of hematological profile in patients of a public hospital of Peshawar

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ABSTRACT

Introduction: Malaria remains the among the top global killers, causing 1-3 million deaths a year, with children under five being the major victims, accounting for about 60% of malarial deaths worldwide. Among other hematological changes in patients, thrombocytopenia and anemia remain the hallmark of the disease.

Objective: To document the occurrence and severity of thrombocytopenia and anemia in proven malaria patients of a public sector hospital of Peshawar, Khyber Pakhtunkhwa, Pakistan.

Materials & Methods: A cross-sectional study was performed in Government Naseerullah Khan Babar Memorial Hospital, Peshawar, from August 2018 to July 2019. All patients confirmed to be malarial parasite positive cases were enrolled in this study after informed consent, and their complete hematological profiles were obtained using automatic hematology analyzer. Descriptive data analysis was done using SPSS 20.

Results: A total of 146 patients were enrolled in the study, including 64% males and 36% females of ages 7-71 years, the most frequent age group being 20-32 years (40 patients). Malarial parasites identified by microscopy were *Plasmodium vivax* 98% and *Plasmodium falciparum* 2%. A significant correlation was seen between anemia and thrombocytopenia ($p=0.01$). Thrombocytopenia was found in 75% of study population while 33% of patients were found to have anemia.

Conclusion: Thrombocytopenia and anemia were the major hematological abnormalities observed in majority of malaria positive cases, being most common in malarial *vivax* species.

Keywords: Malaria; Thrombocytopenia; Anemia; *Plasmodium Vivax*.

The authors declared no conflict of interest. All authors contributed substantially to the planning of research, data collection, data analysis, and write-up of the article, and agreed to be accountable for all aspects of the work.

INTRODUCTION

Malaria is caused by bite of *Anopheles* mosquitoes through inoculating the sporozoites of plasmodium parasite in blood stream that leads to clinical manifestation after completing its incubation period.¹ Up till now four species of plasmodium have been identified that can cause malaria in humans these includes *Plasmodium vivax*, *Plasmodium falciparum*, *Plasmodium malariae* and *Plasmodium ovale*.² As reported by WHO, 40% of global population is at risk of developing Malaria, and the infected people are about 300-400 million.³ Mortality rate due to malaria is about 2 million people per year.⁴

Pakistan has very high infectivity rate of malaria; according to a report generated by the Directorate of Malaria Control, one out of every 1000 people is infected with malaria.⁵

Malaria transmission occurs throughout the year but there is aggressive spread of infection during and after monsoon season.

Diagnosis of Malaria is mainly based on microscopy; however, malaria parasite may not be detected on single slide for that reason multiple slides are used for diagnosis. Typical clinical features of malaria are high grade fever, shivering, vomiting and jaundice; in addition to that malaria patient may present with hemolytic anemia, thrombocytopenia and hemoglobinuria.⁶ A strong association of malaria with changes in hematological profile of patients has been reported.⁷⁻¹⁰ These changes in hematological profile include thrombocytopenia, anemia and leucopenia irrespective of malaria species and ethnic group of patients.⁸ Thrombocytopenia has been correlated with malaria infection and is frequently reported by scientist in their studies.^{7,11} Thrombocytopenia is also found in other acute febrile illnesses, that is why a significant correlation between malaria and thrombocytopenia is necessary for using it as a hematological parameter of the infection. Thrombocytopenia has correlation with malaria according to various studies; its incidence been shown to be from 24%-94% in malaria cases.¹²⁻¹⁴ This thrombocytopenia in association with malaria is supposed to be due to splenic sequestration, destruction by immune system and decreased life span of platelets.

Thrombocytopenia may be accompanied by bleeding tendencies that is one of the severe clinical manifestations of malaria. This study was designed to determine the frequency and severity of thrombocytopenia and anemia in malaria parasites positive patients.

MATERIALS & METHODS

A cross sectional study conducted at Government Naseer Ullah Babar Memorial Hospital, Peshawar, Khyber Pakhtunkhwa, Pakistan from August 01, 2018 to July 31, 2019 on all malaria parasite positive patients using convenience sampling; patients with thrombocytopenia due to other causes were excluded, as well as patients having bacterial or viral infection other than MP positive diagnosed on routine laboratory investigations.

RESULTS

Total 146 malarial patients were enrolled in this study, out of which 94(64.4%) were males and 52(35.6%) were females. Ages were from 7-71 years with a mean age of 33.68 ± 15.94 years.

Figure 1 gives the distribution of gender by age groups. Patients were divided into five age groups, group 1 (7-19 years), group 2 (20-32 years), group 3 (33-45 years), group 4 (46-58 years) and group 5 (59-71 years) to find out the most common age group of malaria patients; the group with most malarial positive patients was group 2 having 40 patients (25 males and 15 females).

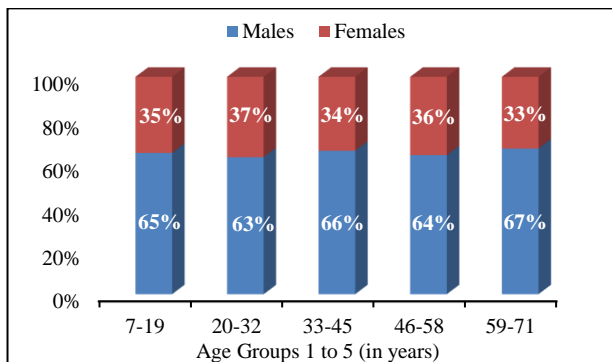


Figure 1: Distribution of patients by age groups and gender (n=146).

Patients having hemoglobin levels less than 12g/dl were taken as anemic. Figure 2 indicates that anemia was more common in male patients as compared to females. Out of 146 patients 98(67%) patients were non-anemic and 48(33%) patients were anemic; among these 48 anemic patients 32(67%) were males and 16(33%) were females.

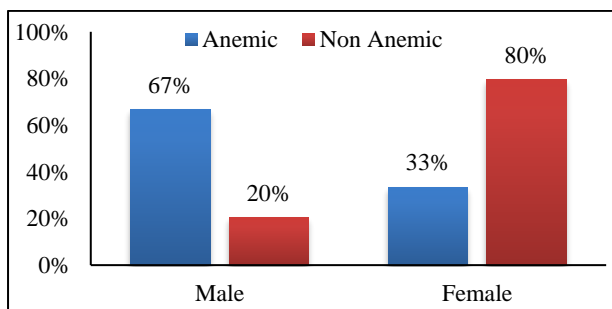


Figure 2: Distribution of anemic patients by gender (n=146).

Patients having platelets level below 150,000/cmm were considered thrombocytopenic. Patients were divided into four study groups according to their platelets level, grade 1(75,000-150,000/cmm), grade 2(50,000-75,000/cmm), grade 3(25,000-50,000) and grade 4(less than 25,000). As shown in Figure 3, total of 86(58.9%) patients were observed to be thrombocytopenic grade 1 in which 59 were males and 27 were females. Grade 2 thrombocytopenia was observed in total 8 patients among that 5 were males and 3 were females. Grade 3 thrombocytopenia was observed in 4 patients including one male and 3 females while grade 4 thrombocytopenia was observed in 12 patients including 6 males and 6 females; thus 110 (75%) patients were thrombocytopenic and 36 (25%) patients were having normal platelets count (Figure 3).

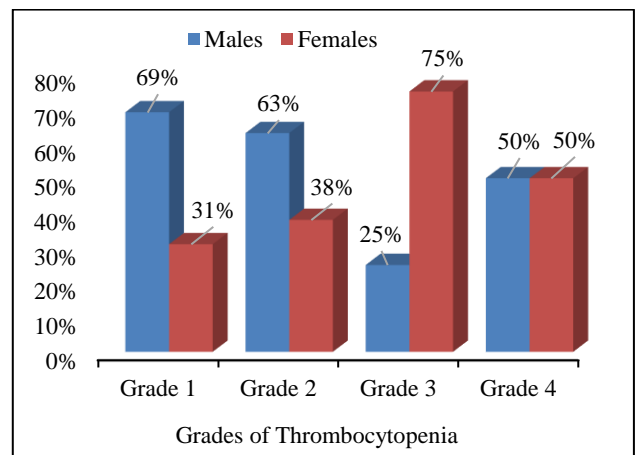


Figure 3: Distribution of grades of thrombocytopenia by gender (n=110).

A significant correlation (p=0.001) was seen between anemia and thrombocytopenia in malaria positive patients (Table 1).

Table 1: Correlation between hemoglobin level and platelet count in thrombocytopenic malarial patients (n=110).

X Axis	Y Axis	r value	p value of r
Hemoglobin level	Platelet count	0.267	0.001

DISCUSSION

Malaria is major health problem in endemic zones, killing thousands of patients every year^{15,16} and to some extent is accountable for deranged social and economic burden as it affects health expenditure. It decreases economic progress about 1.3% annually in developing countries where its prevalence is high.⁵ In Pakistan 1 person per thousand populations is having malaria.⁵ Beside this it has multi system involvement with high mortality and morbidity rate.

The present study was carried in Government Naseer Ullah Khan Babar Memorial hospital, Peshawar, on 146 malaria positive patients. There were 64% males and 36% females, the most common age group affected being 20-32 years having 63% males and 38% females. The study findings were similar to the study reported by Sheik Hussain et al¹⁷ in which the most common gender infected by malaria parasite was male at 72.5%, while females were 27.4%. In our study out of 146 total patients 48 were anemic. In these 67% were males and 33% were females.

Anemia is considered as a common complication of malaria. The mechanism responsible for its causation is deranged splenic sequestration, erythropoiesis and high rate of hemolysis.^{18,19} The study reported by Rodríguez-Morales et al²⁰ showed much higher prevalence of anemia (95%) in malaria positive patients than our study.

The present study also assessed the degree and severity of thrombocytopenia in malaria positive patients. Malaria affects all types of blood cells including platelets.²¹ That is due to release of factors from malarial parasites that suppress the production of platelets from megakaryocyte. In our study grade 1 thrombocytopenia was most common, affecting 86 patients, (males 69% and females 31%). Our results are in conformity with the study outcome of other studies, reporting thrombocytopenia 48% and 57% respectively.¹⁷⁻²¹ In this study severe thrombocytopenia grade 4 was found in 12 patients with same prevalence in males 50% and females 50%, grade 2

thrombocytopenia was present in 8 patients in which 62% were males and 38% were females. Grade 3 thrombocytopenia was present in only 4 patients affecting females 75% more than males 25%.

Literature shows that thrombocytopenia is the most common hematological complication of malaria.¹⁷⁻²⁶ In the present study we found a positive association between anemia and thrombocytopenia. Report of different studies has shown that transfusion is required due to low hemoglobin level and severe thrombocytopenia²⁷⁻²⁹ in complicated malaria cases. Thus, all patients diagnosed as malaria positive should be monitored for anemia and thrombocytopenia.

CONCLUSION

Thrombocytopenia and anemia were the major hematological abnormalities observed in majority of malaria positive cases, most common in *Plasmodium vivax* species.

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