ORIGINAL ARTICLE

ANALYSIS OF HAEMATOLOGICAL COMPLICATIONS IN VIVAX AND FALCIPARUM MALARIA IN IN-DOOR PATIENTS IN A TERTIARY CARE HOSPITAL IN PAKISTAN

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ABSTRACT

Objective: This study was aimed to determine the frequency of hematological complications in patients suffering from vivax and falciparum malaria.

Material and methods: After getting approval from the hospital E&RC, all the patients above 14 years who presented with malaria, were included in the study. Blood was collected from the patients for the malarial parasite. Malaria was diagnosed on the basis of thick stain while subtype vivax malaria was on the basis of thin stain. All the data was collected on a purposefully predesigned proforma.

Results: A total of 350 patients were included in our study, males 250 (71.4%) while females 100 (28.6%). The mean age of our patients was 55.1 years (ranging from 15 to 70 years). The most common hematological complications in our patients suffering from malaria were Thrombocytopenia (69%), anemia (65%), Leukopenia (39.14%), Neutrophilia (29.14%), and Lymphopenia (31.71%).

Conclusion: Hematological complications are prevalent in patients with Vivax and Falciparum malaria in our population and these are some of the diagnostic markers of these conditions.

Keywords: Hematological complications, malaria

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INTRODUCTION

Malarial is a parasitic disease, Plasmodium protozoa which is the causative agent, is transmitted by the bite of an infected female Anopheles mosquito. About 350–500 million people get the disease annually, the majority of the cases are caused by P. vivax or P. falciparum. about 1.1–2.7 million people die annually due to severe malaria. Malaria accounts for the fifth leading cause of death due to infectious diseases globally, but it is the second leading cause of death in African Countries. [1] The development of resistance of the parasite to the available drugs and resistance of the vector to insecticides are the main reasons for failed Malaria control programs. [2]

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It is a quite common infection in Asia and Africa, where a lot of people suffer from malaria throughout the year. [3] Plasmodium vivax is the second commonest cause of malaria globally, but it is the leading cause of malaria in Pakistan. [4] Though, the infection is seldom fatal but it puts a significant economic burden on the population. The Hyponozoite form of Plasmodium vivax may remain dormant in the liver for many months and may cause recurrent malaria. [5, 6] The plasmodia after entering the blood, penetrate into the red blood cells, feed on intracellular proteins and hemoglobin, and metabolize the glucose inside the RBCs 70 times faster than the RBCs themselves, leading to lactic acidosis and hypoglycemia. The plasmodia suppress hemopoiesis and lead to the lysis of infected and uninfected RBCs, which are cleared by the spleen at an increased rate, leading to splenomegaly and anemia. Bone marrow suppression may also occur. Anaemia may occur in 25% of patients, while thrombocytopenia occurs in about 50-68% of patients. Some of the patients may have features suggestive of hemolysis, some develop bone marrow suppression and up to 05% of patients may have elevated WBCs. [7] Compared to vivax, Falciparum malaria has a higher degree of parasitemia and impaired general

health condition, affecting consciousness, splenomegaly, anemia, and increased creatinine level. [8, 9] Although, pancytopenia is caused more commonly by plasmodium falciparum infection, it can present as an initial manifestation of plasmodium vivax infection as well. Such patients deserve special attention, as they may have poor clinical outcomes. [10] Rarely, pancytopenia can present as an initial manifestation of vivax malaria. Fortunately, the uncomplicated vivax malaria shows a very good response to oral chloroquine with 100% efficacy. [11-13] Vivax malaria should be eradicated vertically through Primaquine for 14 days. [14-16]

The main aim of our study was to determine the hematological complications of vivax and falciparum malaria in patients admitted to the Department of Medicine in Khyber Teaching Hospital. If these causes are identified and treated well in time, the morbidity and mortality in our patients will be reduced.

MATERIAL AND METHODS

We conducted this descriptive cross-sectional study after approval from the Committee for Ethical Review of Research involving Human Subjects of Khyber Medical College, Peshawar in the Department of Medicine of Khyber Teaching Hospital, Peshawar, from June 2020 to December 2021. All patients, >14 years of age, having pancytopenia, who agreed to be included in the research, were included in the study. Patients having a history of blood transfusion and patients who declined consent for research were excluded from the research. Consecutive sampling was done from admitted patients. Data was collected on a proforma. Five ml of blood was collected from a vein of patients with aseptic techniques and sent to the main laboratory of the hospital. Peripheral smears and thick and thin slides were prepared. An automated, CELL-DYN 1800 hematology analyzer was used to determine Hematological parameters. Malaria parasite density was calculated by using the standard formula of counting the asexual parasites against 200 white blood cells. Data included demographic variables like age, gender, and socioeconomic status of patients. All the data was entered into Excel and analyzed. Standard deviations and Mean were calculated for numerical variables while percentages and frequencies were calculated for categorical variables.

RESULTS

A total of 350 patients were included, with a mean age of 55.1 years ranging from 15-70 years), 1.2:1 was the ratio between male and female patients. In our study, 250 (71.4%) patients were males, and 100 (28.6 %) were females. See Table 1 for details of hematological parameters, table 2 for the frequencies of both vivax and falciparum malaria, and table 3 for the frequencies of different hematological parameters in patients included.

Table 1: The mean values of hemoglobin, leukocyte, and platelet counts.

	Total number	Mean	Std. Deviation
Hemoglobin of patient in G/dl	350	8.8667	1.77
Leukocyte count	350	2.843×103	3.31
Platelet count	350	77.25×109	2.90

Table 2: Frequency of vivax and falciparum positive and negative patients

Type	Frequency	Percent
Vivax positive	184	52.6%
Falciparum positive	81	23.14%
Mix infection	63	18%
Malaria parasite not seen	22	06.28%

Table 3: Hematological abnormalities in our patients

Hematological Abnormalities	Present	Absent	Percentage
1. Thrombocytopenia	241	109	69%
2. Anemia	227	123	65%
3. Leukopenia	137	213	39.14%
4. Neutrophilia was present in	102	248	29.14%
5. Lymphopenia	111	239	31.71%

DISCUSSION

In our study, P. vivax was seen in 52.6%, P falciparum was seen in 23.14%, while mix infection was present in 18% of our patients as compared to 53%, 49.6% and 42.7% as reported by Lin E et al, but Marine G et al has reported mixed infection in 10.75% of patients by real-time PCR showed in one area, 12.7 % in eastern French Guiana but 1.4% in western French Guiana. [17, 18] Thrombocytopenia was present in 69% of our patients, 73% in Plasmodium Falciparum patients and 65% in plasmodium vivax patients. The mean platelets counts were 77.2×10^9/Cmm (±2.90 SD). Thrombocytopenia was present in 84% and anaemia in 67% patients. An inverse correlation has been reported between lymphocyte count, platelet count, and P. falciparum and P. vivax parasite density. [19] The commonest hematological abnormality in patients suffering from malaria is thrombocytopenia caused by increased platelet destruction due to circulating immune complexes and splenomegaly. [20-22]. An inverse relationship has been described between Thrombocytes and parasitemia density in peripheral blood as the degree of malaria parasitemia increases the platelet level decreases, so thrombocytopenia indicates the severity of malaria. [23-25] Anaemia is the second most common hematological abnormality in patients suffering from P. falciparum compared to P. vivax. Our findings closely match the findings reported by Jain and Kaur and Shah et al, but differ from other studies re-

ported from UAE, in which there was no significant difference in the frequency of anemia between P. vivax (63%) and P. falciparum (67%) patients, and frequency of anemia in the two malaria groups was also almost equal i.e. 61.9% in P. Vivax and 56% in P. falciparum. [26- 29]. Increased mechanical destruction of the parasitized RBCs, reduced production of RBCs in bone marrow, and phagocytosis of parasitized RBCs are the main causes of anemia in patients suffering from malaria.

Neutrophilia was present in 29.14% of our patients suffering from falciparum malaria. This finding is much lower than the figure of 65.8% in P. Vivax and 48% in P. falciparum infection reported by another study. [30] Lymphopenia, in our study, was much lower in frequency than reported by Abro AH from Dubai where about half of the patients had this abnormality. [28]

Some of the limitations of our study include single-center observation, in a specific population. Further multicenter studies of this kind with the involvement of different races and ethnicities need to be conducted to find the true prevalence of these hematological parameters.

CONCLUSION

The common hematological complications in patients suffering from malaria are Thrombocytopenia, anemia, Leukopenia, Neutrophilia, and Lymphopenia in decreasing order and these are some of the diagnostic markers of these conditions.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Iqbal S: Main Idea, Research proposal

Sardar J: Data Collection and writing

Khan HA: Review and proofreading

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Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.