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HEMATOLOGICAL PROFILE OF MALARIA PATIENTS IN FLOOD AFFECTED AREAS OF SINDH

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ABSTRACT:

Objective: To evaluate the hematological profile of malarial patients.

Methods: This cross-sectional study was carried out at Bilawal Medical College, Liaquat University of Medical and Health Sciences, Jamshoro. The sampling technique was non –probability convenience sampling.

A total of 72 patients who were diagnosed with positive malaria parasite on peripheral smears of both genders aged between 10 to 70 years were included in the study whereas patients diagnosed with dengue, congo, and chikungunya were excluded from the study. Their blood complete picture reports were carried from the Diagnostic and Research Lab, Kotri branch. Their blood complete picture was studied. Data was analyzed on IBM SPSS version 23.0.

Results: In malaria-affected people, living in flood-affected areas, 54.2% of patients were suffering from normocytic, normochromic anemia but 45.8% of individuals identified with microcytic, hypochromic anemia. Mostly the patients presenting were positive for plasmodium vivax (83.6%) while, 16.7% presented with plasmodium falciparum positive. There was a statistically significant difference in RBC count, MCV, MCHC, MCH, neutrophils, lymphocytes, and platelets count between plasmodium falciparum positive and plasmodium vivax positive malaria.

Conclusion: In flood-affected areas, malaria was prevalent with more cases positive for plasmodium vivax. The majority of the patients had decreased platelet count, decreased MCV, MCHC, and RBC count with low hemoglobin concentration.

Keywords: flood, malaria, anemia, platelet count

Introduction:

Compared to any other illness of public health concern in emerging nations, malaria disproportionately affects the poor. Evaluating the incidence of malaria is crucial for the effectiveness of national malaria control efforts in areas with limited resources.[1] In Pakistan, malaria is still a significant public health issue despite significant advances.[2] Plasmodium vivax, P. malariae, P. falciparum, P. ovale, and P. knowlesi are different species of malaria. Amongst them, P. vivax and P. falciparum (18%) are the two most prevalent Plasmodium species in Pakistan. The parasite index indicates the average parasitemia in a given sample. It is calculated by counting the number of infected red blood cells in relation to 1,000 red blood cells under a microscope. It is one of the hematological indicators of the poor prognosis of severe malaria. It is helpful in measuring the severity, treatment response, and prognosis, as hyper-parasitemia leads to high mortality. Changes in hematological parameters like hemoglobin, total leukocytes, and platelet counts are the hallmark of malarial infection.[3] The effects of malaria were profound on molecular, hepatic, hematological, as well as electrolyte parameters. Therefore, they should indeed be carefully observed in all diagnosed instances of malaria. This would facilitate the treating clinician to make the best clinical decision-making. The modifications in hematologic and biochemical profiles are dependent on the underlying causative malaria parasite, certain demographic characteristics, residing area, nutritional status as well as on absence /presence of hemoglobinopathies. Consequently, the aforementioned factors are monitored very well in the time of illness due to malaria, they are of enormous significance to the treating physician to acquire a decision on prognosis and supplementary managing such cases.[4] In developing countries, due to socioeconomic conditions, people living there are, at risk of undesirable health consequences from floods, specified un-regulated grounds employed in flood-prone areas with lesser public health care infrastructure as well as unclean un-hygiene areas. The consequences of extreme weather events are most vicious in the least developed because they are more susceptible to the negative effects of hazards, have weaker coping mechanisms, and may require a longer duration to recover and rebuild. [5] Massive flooding is occurring in Pakistan as a result of the monsoon rains, which began in early June and grew worse during the following months. According to sources, as of November 2022, more than 1700 people have died as a result of the devastating floods, which affected almost 33 million people. The worst-affected provinces are Sindh and Balochistan. Even though the water has started to recede, several infectious illnesses, including malaria, dysentery, dengue, cholera, diphtheria, scabies, and COVID-19, start developing infectious outbreaks that are contributing to the rising death toll.[6] Over 350000 instances of malaria and 113 fatalities from these mosquito-borne illnesses were reported in Pakistan in 2021. Notably, due to a lack of adequate facilities, malaria is frequently misdiagnosed or underreported. As a result, according to the WHO, there were approximately 956000 instances of malaria, which led to 805 fatalities.[7]

This study was proposed to evaluate the hematological profile of malarial patients.

Methods: This cross-sectional observational study was carried out at the Department of Internal Medicine, Bilawal Medical College, Liaquat University of Medical and Health Sciences, Jamshoro, from May 2022 to October 2022. The sampling technique was non –probability purposive sampling. From flood-affected areas, i.e., Kotri, a total of seventy-two(n= 72) patients were diagnosed with positive malaria parasites on peripheral smears. All the diagnosed cases with either gender having an age between 10 to 70 years were included in the study whereas patients diagnosed with dengue, congo, and chikungunya were excluded from the study. Their blood complete picture reports were carried from the Diagnostic and Research Lab, Kotri branch. Their blood complete picture was studied and its parameters were entered into the SPSS data sheet and analyzed. The p-value <0.05 was considered statistically significant.

Results:

Mean age of the study population, presenting with malaria was 28.36 ±13.65 years. **(Table 1)**
Among them, 63.89% were males, and 36.11% were females. **(fig 1)**

Table 1: Descriptive statistics of Age in the study population (n=72)

	Minimum	Maximum	Mean	Std. Deviation
Age(in years)	16.00	74.00	28.3611	13.65810

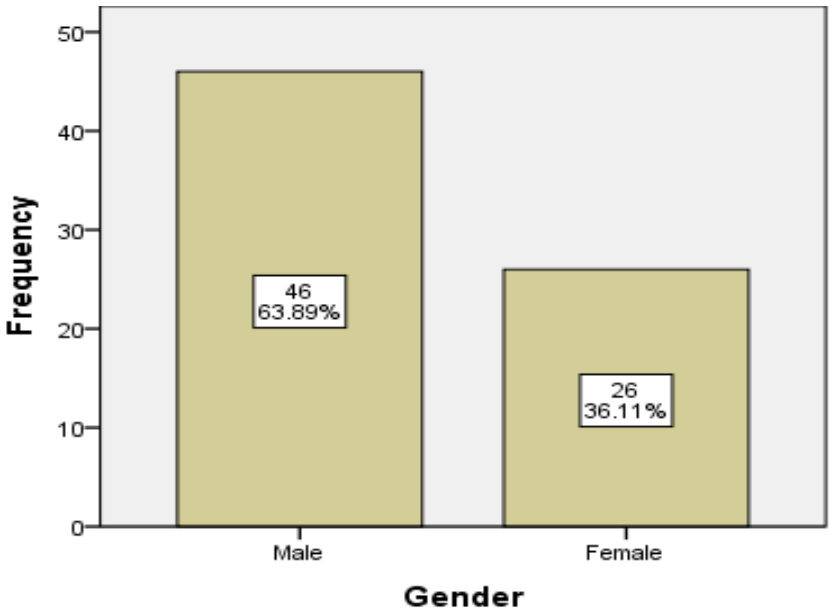

Figure 1: Gender distribution in the study population (n=72)

Mostly the patients presenting were positive for plasmodium vivax (83.6%) while, 16.7% presented with plasmodium falciparum positive. (**Table 2)**

Table 2: Frequency of underlying parasitic infection in the study population (n=72)

	Frequency	Percent
Plasmodium Vivax	60	83.3
Plasmodium Falciparum	12	16.7
Total	72	100.0

In malaria-affected people, living in flood-affected areas, 54.2% of patients were suffering from normocytic, normochromic anemia but 45.8% of individuals identified with microcytic, hypochromic anemia. (**Table 3)**

Table 3: RBC size and Hemoglobin in the study population(n=72)

	Frequency	Percent
Normocytic, normochromic	39	54.2
Microcytic, hypochromic	33	45.8
Total	72	100.0

Mean hemoglobin con was 11.43 g/dlwith SD 2.84 years, hematocrit was 34.83±8.2, RBC was 4.49±0.99, MCV was77.99±9.6, MCH was 25.42±4.07, MCHC was 32.49±1.88, WBC count was 5.99 ±3.1, neutrophils were 58.37±17.15, lymphocytes were 30.62 ±15.05, monocytes were 8.55±4.6, eosinophils were 2.01±2.52 and basophils were 0.42±0.2; while the platelet count was decreased up to 100.02±50.77. **(Table 4)**

Table 4: Hematologic Profile In Malaria Patients (n=72)

	Mean	Std. Deviation
Hemoglobin	11.43	2.84
Hematocrit	34.83	8.21
RBC	4.49	0.99
MCV	77.99	9.63
MCH	25.42	4.07
MCHC	32.49	1.88
WBC	5.99	3.19
Neutrophils	58.37	17.15
Lymphocytes	30.62	15.05
Monocytes	8.55	4.61
Eosinophils	2.01	2.52
Basophils	.42	.28
Platelet countx10^3µl	100.02	50.77

There was a statistically significant difference in RBC count, MCV, MCHC, MCH, neutrophils, lymphocytes, and platelets count between plasmodium falciparum positive and plasmodium vivax positive malaria, (*p*-value<0.01, *p*-value<0.01, *p*-value<0.01, *p*-value<0.01, *p*-value=0.03, *p*-value=0.03 and *p*-value=0.04 respectively) **Table 4**

Table 4: Comparison of hematological profile in falciparum positive(n=12) and vivax positive (n=60) malaria

Variables	**Plasmodium Falciparum positive**	**Plasmodium Vivax positive**	***p*-value**
Hemoglobin	11.72±3.8	11.37±2.6	0.69
Hematocrit	36.32±9.9	34.53±7.8	0.49
RBC	5.39±0.3	4.31±0.9	<0.01**
MCV	66.61±15.7	80.26±5.8	<0.01**
MCH	20.54±6.3	26.40±2.5	<0.01**
MCHC	30.90±2.9	32.81±1.4	<0.01**
WBC	6.61±2.3	5.87±3.3	0.46
Neutrophils	67.70±1.4	56.51±18.2	0.03*
Lymphocytes	22.45±2.3	32.27±2.3	0.03*
Monocytes	7.52±7.5	8.76±4.9	0.39
Eosinophils	1.97±0.6	2.02±2.7	0.95
Basophils	0.37±0.2	0.43±0.2	0.54
Platelet countx10^3µl	73.75±6.7	105.28±54.0	0.04*
ESR	27.00±9.1	21.50±14.8	0.09
MCV-mean corpuscular volume, MCH- mean corpuscular hemoglobin, MCHC- mean corpuscular hemoglobin concentration, WBC- White blood cells, ESR- Erythrocyte sedimentation rate			

Discussion:

Thousands of lives have been lost as a direct result of these floods, while millions more are at risk of falling victim to water-borne diseases such as malaria and dengue.[7]

Excessive rainfall, like the floods illustrated here, might provide serious difficulties for malaria control efforts and necessitate prompt action to reduce negative effects on human health..[8] Present study was carried out on cases of malaria reported at Bilawal medical college Hospital, Kotri from the flood affected nearby areas. The present study revealed a significant decrease in hemoglobin, hematocrit, MCV, MCH, MCHC, and platelet count in malaria patients reported from flood-affected areas. In present research, 45.8% patients of malaria revealed with microcytic and hypochromic anemia. A BMJ article[9] claims that the floods in Pakistan provide significant health risks. Local

rescue workers and public health professionals have expressed concern about an increase in many waterborne and mosquito-borne illnesses as a result of a third of Pakistan being submerged by the floods that have affected more than 33 million people. Similar to the present study, Pinedo-Cancino V, et al.[10] revealed a significant decrease in hematocrit, WBC, and neutrophils. According to Kini RG, Chandrashekhar J., [11] Malaria is known to produce hematological abnormalities including anemia and thrombocytopenia due to Pf and Pv, which are considered a hallmark of malaria. Similar to the present study, Ullah I, et al.[12] carried similar research in Peshawar and found that the red blood cells, hemoglobin concentration, MCHC, WBC count, and platelets were found to be decreased significantly in both plasmodium falciparum and plasmodium vivax infected groups as compared to the controls. Meanwhile, a reduced count of lymphocytes with increases in hematocrit and monocyte count was observed in plasmodium vivax-positive patients. However, there was no noteworthy dissimilarity was observed in the neutrophil and eosinophil count as well as in level of MCH and MCV among the three groups. The present study has also compared the hematological parameters between plasmodium falciparum positive and vivax positive cases and found a significant decrease in hemoglobin, RBC, MCV, MCHC, and platelets count in plasmodium vivax as compared to plasmodium falciparum positive. The present study revealed 83.6 % plasmodium vivax positive and 16.4% plasmodium falciparum positive. Similarly, Kashif N et al.[13] found 98% positive for vivax and remaining positive for falciparum and found significant thrombocytopenia and anemia in affected patients. Thrombocytopenia and anemia were the major hematological abnormalities observed in the majority of malaria-positive cases, most common in Plasmodium vivax species.

In Pakistan, torrential downpours that accompany the monsoon climate have a negative influence on human health as well as had impact on the quality of healthcare services. The qualitative analysis of Pakistan's district health systems' performance during floods was conducted in five districts that are prone to flooding. This analysis found several health system barriers that hindered district health systems' ability to provide necessary medical treatment during floods. Therefore, this study brought attention to the need to enhance district health systems' ability to efficiently address the demand for medical services during floods.[14] Malaria is a serious disease with complications like thrombocytopenia and anemia, if not timely reported, and treated then, it may contribute to increases in the mortality ratio.

Conclusion:

In flood-affected areas, malaria was prevalent with more cases positive for plasmodium vivax. The majority of the patients had decreased platelet count, decreased MCV, MCHC, and RBC count with low hemoglobin concentration. Policymakers and healthcare providers should emphasize strategies to cope with the situation for better health and a decrease in the mortality ratio in flood-affected areas.

Conflict of interest: None declared.

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