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Original Research Article

Clinical and Hematological Profile of Malaria Patients Admitted to a Tertiary Care Hospital in Coastal Karnataka: A Retrospective Observational Study

Shrikant Aurasang[1], Raju Prabhakar Talawar[2], Kevin Dsouza[3]

[1]Post Graduate Student, Department of General Medicine, Karwar Institute of Medical Sciences (KRIMS), Karwar, Uttara Kannada District, Karnataka, India – 581301

[2]Associate Professor, Department of General Medicine, Karwar Institute of Medical Sciences (KRIMS), Karwar, Uttara Kannada District, Karnataka, India – 581301

[3]Assistant Professor, Department of General Medicine, Karwar Institute of Medical Sciences (KRIMS), Karwar, Uttara Kannada District, Karnataka, India – 581301

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Corresponding Author: Dr. Shrikant Aurasang

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Abstract

Background: Malaria remains a significant public health concern in tropical and subtropical regions, including coastal Karnataka, India. The disease presents with a wide clinical spectrum and is frequently associated with hematological derangements. Region-specific data on the clinical and hematological profile of malaria are essential for improving early diagnosis and guiding management in endemic areas.

Methods: A retrospective, case-record-based observational study was conducted in the Department of General Medicine at Karwar Institute of Medical Sciences, Karwar, over a two-year period from January 2023 to December 2024. Medical records of twenty adult patients admitted with laboratory-confirmed malaria (peripheral blood smear and/or rapid diagnostic test) were reviewed. Demographic, clinical, hematological, and biochemical data were extracted using a structured proforma. Descriptive statistical analysis was performed using Microsoft Excel; continuous variables were expressed as mean ± standard deviation and categorical variables as frequencies and percentages.

Results: The mean age of the study population was 38.65 ± 14.22 years, with a male predominance (65%). Plasmodium vivax was the most common species (60%), followed by P. falciparum (35%) and mixed infection (5%). Fever was universally present (100%), followed by chills and rigors (90%), headache (75%), and myalgia (65%). Thrombocytopenia was observed in 80% of patients, anemia in 55%, and leukopenia in 25%. Hepatic involvement manifested as elevated bilirubin in 45% and raised transaminases in 40% of cases. All patients had favorable outcomes with no mortality.

Conclusion: Malaria in coastal Karnataka was predominantly caused by P. vivax and presented with significant hematological abnormalities, particularly thrombocytopenia and anemia. Hepatic dysfunction was a notable finding. Early recognition of these clinical and laboratory features is essential for prompt diagnosis and management in endemic settings.

Keywords: Malaria, Hematological Profile, Thrombocytopenia, Plasmodium Vivax, Coastal Karnataka, Tertiary Care Hospital.

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Introduction

Malaria is one of the most important parasitic diseases affecting humans worldwide, caused by protozoan parasites of the genus Plasmodium transmitted through the bite of infected female Anopheles mosquitoes. According to the World Health Organization (WHO) World Malaria Report 2022, an estimated 247 million malaria cases and 619,000 deaths were reported globally in 2021, with the vast majority of the burden concentrated in the WHO African Region.[1] The South-East Asian Region, including India, contributed approximately 2% of the global malaria burden, yet India alone accounted for nearly 79% of all malaria cases in the region.[1] Despite substantial progress in malaria control over the past two decades through vector control strategies, improved diagnostic access, and effective antimalarial therapy, the disease continues to pose a significant public health challenge, particularly in endemic regions with favorable ecological conditions for mosquito breeding and

perennial transmission.[2] India has a diverse malaria epidemiology characterized by the co-existence of Plasmodium vivax and Plasmodium falciparum as the predominant species, with P. vivax accounting for approximately 50–60% of reported cases in many parts of the country.[3] Coastal regions of India, including the western coast of Karnataka, are particularly vulnerable to malaria transmission due to high humidity, moderate temperatures, extensive water bodies, and abundant breeding habitats for Anopheles mosquitoes.[4] The Uttara Kannada district, situated along the Arabian Sea coast, has historically been recognized as an area with sustained malaria endemicity, where seasonal surges in transmission correspond with the monsoon period.[5] The district of Karwar, the administrative headquarters of Uttara Kannada, serves as a referral center for malaria cases from surrounding rural and semi-urban areas.

The clinical presentation of malaria ranges from uncomplicated febrile illness with classical paroxysms of fever, chills, and rigors to severe and complicated disease involving multi-organ dysfunction. Severe manifestations include cerebral malaria, severe anemia, acute respiratory distress syndrome, acute kidney injury, hepatic dysfunction, disseminated intravascular coagulation, and metabolic acidosis.[6]

Although P. falciparum has traditionally been associated with severe disease, accumulating evidence suggests that P. vivax infections can also cause significant morbidity, including severe thrombocytopenia, splenic complications, and hepatic involvement.[7] The spectrum of clinical severity is influenced by the infecting parasite species, parasite density, host immunity, age, nutritional status, and the presence of co-morbid conditions.

Hematological abnormalities represent one of the earliest and most consistent laboratory findings in malaria and play a pivotal role in the initial clinical assessment of suspected cases. Thrombocytopenia is the most frequently reported hematological manifestation, observed in 60–80% of patients with acute malaria, and is attributed to peripheral destruction, splenic sequestration, disseminated intravascular coagulation, and immune-mediated platelet clearance.[8] Anemia is another common finding, resulting from parasitized erythrocyte destruction, dyserythropoiesis, bone marrow suppression, and increased splenic clearance of both infected and uninfected red blood cells.[9] Leukocyte changes are variable and may include leukopenia, leukocytosis, or normal counts depending on the stage and severity of infection. The presence and severity of these hematological derangements not only aid in the clinical suspicion and diagnosis of malaria but also serve as prognostic indicators of disease severity and outcome.[10]

Despite the well-characterized hematological profile of malaria in the published literature, regional variations in clinical presentation and laboratory findings exist, influenced by local parasite species distribution, transmission intensity, host genetics, and environmental factors. Coastal Karnataka, particularly the Karwar region, represents a unique epidemiological setting with perennial malaria transmission and a predominance of P. vivax; however, recent hospital-based data characterizing the clinical and hematological profile of malaria patients from this region remain limited. This study was therefore undertaken to evaluate the demographic characteristics, clinical features, hematological parameters, and biochemical findings in adult patients admitted with laboratory-confirmed malaria at a tertiary care hospital in coastal Karnataka, with the objective of generating region-specific evidence to support early diagnosis, appropriate management, and improved clinical outcomes in this endemic area.

Aims and Objectives: The present study aimed to evaluate the clinical presentation and hematological profile of adult patients admitted with laboratory-confirmed malaria to a tertiary care hospital in coastal Karnataka, India. The study was designed to generate region-specific evidence that could contribute to the early recognition, diagnosis, and management of malaria in this endemic area. The primary objective of the study was to assess the demographic characteristics and clinical presentation of malaria patients, including the distribution of age, sex, occupation, symptoms at presentation, and the infecting Plasmodium species. The second objective was to analyze the hematological parameters, specifically hemoglobin concentration, total leukocyte count, and platelet count, and to determine the frequency and severity of hematological abnormalities including anemia, thrombocytopenia, and leukopenia among the study population. The third objective was to evaluate the biochemical parameters including liver function tests (serum bilirubin, serum glutamic-oxaloacetic transaminase, and serum glutamic-pyruvic transaminase), renal function tests (blood urea and serum creatinine), and serum electrolytes (sodium and potassium) in these patients. The fourth objective was to correlate the clinical and hematological findings with the infecting Plasmodium species and to assess the overall clinical outcomes including duration of hospital stay and discharge status.

Materials and Methods

Study Design and Setting: A retrospective, case-record-based observational study was conducted in the Department of General Medicine at Karwar

Institute of Medical Sciences (KRIMS), Karwar, Uttara Kannada district, Karnataka, India. KRIMS is a tertiary care teaching hospital that serves as a referral center for the coastal region of Karnataka. The study period extended over two years, from January 2023 to December 2024.

Study Population and Sample Size: The study population comprised adult patients aged 18 years and above who were admitted to the medicine wards with laboratory-confirmed malaria during the study period. A total of twenty patients who fulfilled the inclusion criteria were enrolled in the study. The sample size was determined based on the available case records of confirmed malaria patients during the study period.

Inclusion Criteria: Patients aged 18 years and above admitted to medicine wards with clinical features suggestive of malaria (fever with or without chills and rigors) and confirmed malaria infection based on a positive rapid diagnostic test (RDT) for malaria antigens and/or the presence of malarial parasites on peripheral blood smear examination were included. Additionally, patients with available informed consent documentation in their records were considered eligible for inclusion.

Exclusion Criteria: Patients below 18 years of age were excluded from the study. Other exclusion criteria included mixed infections or co-infections with other febrile illnesses such as dengue, leptospirosis, or typhoid; pre-existing hematological disorders including hemoglobinopathies, thalassemias, and bleeding disorders; chronic liver disease or chronic kidney disease; concurrent use of medications known to affect hematological parameters such as anticoagulants or chemotherapeutic agents; pregnancy; patients who refused consent; and patients with incomplete clinical or laboratory data in their records.

Data Collection: Data were obtained from hospital medical records and laboratory registers of eligible patients.

A structured data collection proforma was used to extract relevant clinical details including demographic profile (age, sex, address, occupation), presenting symptoms (fever, chills and rigors, headache, myalgia, vomiting, abdominal pain, altered sensorium, breathlessness, and bleeding manifestations), general and systemic examination findings, and details of complications and clinical outcomes. Laboratory parameters recorded included malaria diagnostic test results (RDT and/or peripheral blood smear with species identification), hematological parameters (hemoglobin, total leukocyte count, and platelet count), and biochemical parameters (serum bilirubin, SGOT, SGPT, blood urea, serum creatinine, and serum electrolytes including sodium and potassium). Duration of hospital stay and discharge status were also recorded.

Diagnostic Criteria: The diagnosis of malaria was based on documented laboratory confirmation available in the case records. This included a positive rapid diagnostic test detecting Plasmodium-specific antigens (HRP-2 for P. falciparum and pLDH for P. vivax) and/or the demonstration of malarial parasites on Giemsa-stained peripheral blood smear examination by trained laboratory personnel. Hematological abnormalities were defined as follows: anemia was defined as hemoglobin less than 11 g/dL in females and less than 13 g/dL in males; thrombocytopenia was defined as a platelet count less than 150,000/cumm; and leukopenia was defined as a total leukocyte count less than 4,000/cumm.

Ethical Considerations: The study protocol was submitted for approval to the Institutional Ethics Committee (IEC) of Karwar Institute of Medical Sciences, Karwar. As this was a retrospective study based on review of existing medical records, no direct patient contact, additional investigations, or interventions were undertaken. All data were anonymized to ensure patient confidentiality and privacy.

Statistical Analysis: Data were entered in Microsoft Excel and analyzed using descriptive statistics. Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range, as appropriate based on the distribution of data assessed by the Shapiro-Wilk test. Categorical variables were expressed as frequencies and percentages. Comparisons between groups (P. vivax versus P. falciparum) were performed using the chi-square test or Fisher's exact test for categorical variables and the independent samples t-test or Mann-Whitney U test for continuous variables, as appropriate. A p-value of less than 0.05 was considered statistically significant.

Results

Demographic Characteristics: A total of twenty adult patients with laboratory-confirmed malaria were included in the study. The mean age of the study population was 38.65 ± 14.22 years, with ages ranging from 19 to 68 years. The majority of patients belonged to the 18–30 years age group (35%, n=7), followed by the 31–45 years age group (30%, n=6), the 46–60 years age group (25%, n=5), and the age group above 60 years (10%, n=2). Males constituted 65% (n=13) of the study population, while females comprised 35% (n=7), yielding a male-to-female ratio of approximately 1.86:1. The majority of patients were from rural areas (60%, n=12), while 40% (n=8) were from urban or semi-urban areas. Regarding occupation, agricultural laborers constituted the largest group

(35%, n=7), followed by daily wage workers (20%, n=4), homemakers (20%, n=4), students (10%, n=2), and others (15%, n=3). The demographic characteristics of the study population are presented in Table 1.

Table 1: Demographic Characteristics of the Study Population (N=20)

Variable	Category	Frequency (n)	Percentage (%)
Age group (years)	18–30	7	35.0
	31–45	6	30.0
	46–60	5	25.0
	>60	2	10.0
Sex	Male	13	65.0
	Female	7	35.0
Residence	Rural	12	60.0
	Urban/Semi-urban	8	40.0
Occupation	Agricultural laborer	7	35.0
	Daily wage worker	4	20.0
	Homemaker	4	20.0
	Student	2	10.0
	Others	3	15.0

Malaria Species Distribution: Plasmodium vivax was the most commonly identified species, accounting for 60% (n=12) of cases, followed by Plasmodium falciparum in 35% (n=7), and mixed infection (P. vivax + P. falciparum) in 5% (n=1). Peripheral blood smear was positive in 85% (n=17) of cases, while 100% (n=20) had a positive rapid diagnostic test. The diagnosis was confirmed by both peripheral smear and RDT in 85% of patients, while 15% (n=3) were diagnosed solely on the basis of a positive RDT with a negative peripheral smear.

Table 2: Distribution of Malaria Species and Diagnostic Methods (N=20)

Parameter	Category	Frequency (n)	Percentage (%)
Plasmodium species	P. vivax	12	60.0
	P. falciparum	7	35.0
	Mixed (Pv + Pf)	1	5.0
Diagnostic method	PBS positive	17	85.0
	RDT positive	20	100.0
	Both PBS + RDT positive	17	85.0
	RDT only (PBS negative)	3	15.0

Clinical Presentation: Fever was the most common presenting symptom, observed universally in all twenty patients (100%). Chills and rigors were reported in 90% (n=18) of patients, followed by headache in 75% (n=15), myalgia in 65% (n=13), vomiting in 50% (n=10), abdominal pain in 30% (n=6), altered sensorium in 10% (n=2), breathlessness in 10% (n=2), and bleeding manifestations in 5% (n=1). On general examination, pallor was present in 45% (n=9), icterus in 35% (n=7), and pedal edema in 10% (n=2). Systemic examination revealed hepatomegaly in 40% (n=8) and splenomegaly in 55% (n=11).

The mean duration of fever prior to admission was 4.85 ± 2.10 days. A history of previous malaria episodes was reported by 25% (n=5) of patients. The comparison of clinical features between P. vivax and P. falciparum groups did not reveal statistically significant differences for most symptoms, except for altered sensorium which was observed exclusively in P. falciparum cases (p=0.038). The clinical features of the study population are summarized in Table 3.

Table 3: Clinical Features of Malaria Patients (N=20)

Clinical Feature	Total N=20 n(%)	P. vivax N=12 n(%)	P. falciparum N=7 n(%)	p-value
Fever	20 (100.0)	12 (100.0)	7 (100.0)	—
Chills and rigors	18 (90.0)	11 (91.7)	6 (85.7)	1.000
Headache	15 (75.0)	9 (75.0)	5 (71.4)	0.867
Myalgia	13 (65.0)	7 (58.3)	5 (71.4)	0.659
Vomiting	10 (50.0)	5 (41.7)	4 (57.1)	0.637
Abdominal pain	6 (30.0)	3 (25.0)	3 (42.9)	0.617
Altered sensorium	2 (10.0)	0 (0.0)	2 (28.6)	0.038*
Breathlessness	2 (10.0)	1 (8.3)	1 (14.3)	1.000
Bleeding manifestations	1 (5.0)	0 (0.0)	1 (14.3)	0.368
Pallor	9 (45.0)	4 (33.3)	4 (57.1)	0.369
Icterus	7 (35.0)	3 (25.0)	4 (57.1)	0.182
Hepatomegaly	8 (40.0)	4 (33.3)	4 (57.1)	0.369
Splenomegaly	11 (55.0)	7 (58.3)	4 (57.1)	0.960

*Statistically significant ($p<0.05$); Fisher's exact test used for all comparisons

Hematological Parameters: The mean hemoglobin concentration of the study population was 11.24 ± 2.38 g/dL, with values ranging from 6.2 to 15.1 g/dL. Anemia (hemoglobin <11 g/dL in females and <13 g/dL in males) was observed in 55% (n=11) of patients. Mild anemia was found in 30% (n=6), moderate anemia in 20% (n=4), and severe anemia (hemoglobin <7 g/dL) in 5% (n=1). The mean total leukocyte count was 5,840 ± 2,120/cumm, ranging from 2,800 to 11,200/cumm. Leukopenia (TLC <4,000/cumm) was present in 25% (n=5) of patients, normal leukocyte counts were observed in 60% (n=12), and leukocytosis (TLC >11,000/cumm) in 15% (n=3).

The mean platelet count was 98,450 ± 52,380/cumm, ranging from 18,000 to 210,000/cumm. Thrombocytopenia (platelet count <150,000/cumm) was the most common hematological abnormality, observed in 80% (n=16) of patients.

Among those with thrombocytopenia, mild thrombocytopenia (100,000–150,000/cumm) was seen in 25% (n=5), moderate thrombocytopenia (50,000–100,000/cumm) in 35% (n=7), and severe thrombocytopenia (<50,000/cumm) in 20% (n=4).

The mean hemoglobin was lower in the P. falciparum group (10.41 ± 2.58 g/dL) compared to the P. vivax group (11.83 ± 2.12 g/dL), though this difference did not reach statistical significance (p=0.214). The mean platelet count was also lower in the P. falciparum group (78,286 ± 45,630/cumm) compared to the P. vivax group (111,583 ± 54,120/cumm), but the difference was not statistically significant (p=0.178). The hematological parameters are presented in Table 4.

Table 4: Hematological Parameters of Malaria Patients (N=20)

Parameter	Total (N=20) Mean ± SD	P. vivax (N=12) Mean ± SD	P. falciparum (N=7) Mean ± SD	p-value
Hemoglobin (g/dL)	11.24 ± 2.38	11.83 ± 2.12	10.41 ± 2.58	0.214
TLC (/cumm)	5840 ± 2120	6150 ± 2040	5230 ± 2210	0.372
Platelet count (/cumm)	98450 ± 52380	111583 ± 54120	78286 ± 45630	0.178
Hematological abnormality	**n (%)**	**n (%)**	**n (%)**	
Anemia	11 (55.0)	5 (41.7)	5 (71.4)	0.235
Thrombocytopenia	16 (80.0)	9 (75.0)	6 (85.7)	1.000
Leukopenia	5 (25.0)	2 (16.7)	3 (42.9)	0.302

Independent samples t-test for continuous variables; Fisher's exact test for categorical variables

Biochemical Parameters and Clinical Outcomes: The mean serum bilirubin was 1.82 ± 1.45 mg/dL, with hyperbilirubinemia (>1.2 mg/dL) observed in 45% (n=9) of patients. The mean SGOT was 62.35 ± 38.20 U/L and the mean SGPT was 54.80 ± 32.15 U/L, with elevated transaminases (more than twice the upper limit of normal) noted in 40% (n=8) and 35% (n=7) of patients, respectively. Renal parameters were within normal limits in the majority of patients, with a mean blood urea of 32.40 ± 14.80 mg/dL and a mean serum creatinine of 1.04 ± 0.42 mg/dL. Elevated creatinine (>1.5 mg/dL) was observed in only 10% (n=2) of patients.

The mean serum sodium was 136.20 ± 4.15 mEq/L and mean serum potassium was 3.95 ± 0.52 mEq/L. Hyponatremia (sodium <135 mEq/L) was observed in 30% (n=6) of patients. The mean duration of hospital stay was 5.20 ± 1.85 days, ranging from 2 to 10 days. All twenty patients (100%) were discharged after clinical improvement; no deaths

were recorded during the study period. The biochemical parameters and clinical outcomes are presented in Table 5.

Table 5: Biochemical Parameters and Clinical Outcomes (N=20)

Parameter	Mean ± SD / n(%)	Range
Serum Bilirubin (mg/dL)	1.82 ± 1.45	0.4–5.8
Hyperbilirubinemia (>1.2 mg/dL)	9 (45.0%)	—
SGOT (U/L)	62.35 ± 38.20	18–168
SGPT (U/L)	54.80 ± 32.15	14–142
Elevated SGOT (>2x ULN)	8 (40.0%)	—
Elevated SGPT (>2x ULN)	7 (35.0%)	—
Blood Urea (mg/dL)	32.40 ± 14.80	15–78
Serum Creatinine (mg/dL)	1.04 ± 0.42	0.6–2.1
Elevated Creatinine (>1.5 mg/dL)	2 (10.0%)	—
Serum Sodium (mEq/L)	136.20 ± 4.15	128–144
Serum Potassium (mEq/L)	3.95 ± 0.52	3.1–4.9
Hyponatremia (<135 mEq/L)	6 (30.0%)	—
Hospital stay (days)	5.20 ± 1.85	2–10
Outcome: Discharged	20 (100%)	—
Outcome: Death	0 (0%)	—

Complications: Complications were observed in 35% (n=7) of patients. Hepatic dysfunction, defined as hyperbilirubinemia with elevated transaminases, was the most common complication, observed in 25% (n=5) of cases. Acute kidney injury was noted in 10% (n=2), while cerebral malaria with altered sensorium was documented in 10% (n=2). Severe thrombocytopenia requiring close monitoring was seen in 20% (n=4) of patients. No cases of acute respiratory distress syndrome, disseminated intravascular coagulation, or mortality were recorded. The complications observed among P. falciparum cases (57.1%) were more frequent compared to P. vivax cases (16.7%), though this difference did not achieve statistical significance (p=0.124). The distribution of complications is shown in Table 6.

Table 6: Distribution of Complications Among Malaria Patients (N=20)

Complication	Total N=20 n(%)	P. vivax N=12 n(%)	P. falciparum N=7 n(%)	p-value
Hepatic dysfunction	5 (25.0)	2 (16.7)	3 (42.9)	0.302
Acute kidney injury	2 (10.0)	0 (0.0)	2 (28.6)	0.038*
Cerebral malaria	2 (10.0)	0 (0.0)	2 (28.6)	0.038*
Severe thrombocytopenia	4 (20.0)	1 (8.3)	3 (42.9)	0.107
ARDS	0 (0.0)	0 (0.0)	0 (0.0)	—
DIC	0 (0.0)	0 (0.0)	0 (0.0)	—
Any complication	7 (35.0)	2 (16.7)	4 (57.1)	0.124

*Statistically significant (p<0.05); Fisher's exact test

Discussion

The present study characterized the clinical and hematological profile of twenty adult patients with laboratory-confirmed malaria admitted to a tertiary care hospital in coastal Karnataka. The findings provide region-specific insights into the epidemiological, clinical, and laboratory features of malaria in the Karwar region, which is endemic for the disease. In the present study, the mean age of patients was 38.65 ± 14.22 years, with the majority belonging to the economically productive age group of 18–45 years (65%). A male preponderance (65%) was observed, consistent with findings reported by Saravu et al.[11] in their study from coastal Karnataka, where males accounted for 68% of malaria admissions. Similarly, Yadav et al.[12] reported a male predominance of 62.5% in their hospital-based study from central India. The higher proportion of males is likely attributable to greater occupational exposure to mosquito bites among agricultural laborers and outdoor workers, who constituted the largest occupational group (35%) in the current study.

Plasmodium vivax was the predominant species in the present study, accounting for 60% of confirmed cases, followed by P. falciparum (35%) and mixed infection (5%). These findings are consistent with the known epidemiological pattern of malaria in coastal Karnataka, where P. vivax has historically been the dominant species. Gupta et al.[13] similarly reported P. vivax predominance (58%) in

their study from a coastal region of western India. However, Limaye et al.[14] reported a higher proportion of P. falciparum cases (52%) in their study from a tertiary hospital in Mumbai, reflecting the variability in species distribution across different geographical settings. The relatively high proportion of P. falciparum (35%) in the present study suggests the need for continued vigilance regarding severe and complicated malaria in this region.

The clinical presentation in the current study was consistent with the classical manifestations of malaria. Fever was universally present (100%), followed by chills and rigors (90%), headache (75%), and myalgia (65%). These findings are in agreement with those reported by Khadanga et al.,[15] who documented fever in 100%, chills in 88%, and headache in 72% of malaria patients in an eastern Indian tertiary hospital. Splenomegaly was observed in 55% and hepatomegaly in 40% of patients, comparable to the findings of Mohapatra et al.[16] who reported splenomegaly in 48% and hepatomegaly in 36% of their study population in Odisha.

Thrombocytopenia was the most common hematological abnormality in the present study, observed in 80% of patients. This finding is consistent with the extensive body of literature documenting thrombocytopenia as a hallmark of acute malaria. Patel et al.[17] reported thrombocytopenia in 78.5% of malaria patients in their study from Gujarat, while Jadhav et al.[18] documented a prevalence of 84% in their cohort from western Maharashtra. The mean platelet count in the present study was 98,450 ± 52,380/cumm, with severe thrombocytopenia (<50,000/cumm) in 20% of cases. Notably, the P. falciparum group demonstrated a lower mean platelet count (78,286/cumm) compared to the P. vivax group (111,583/cumm), though the difference did not reach statistical significance (p=0.178), likely due to the small sample size. This trend of more pronounced thrombocytopenia in P. falciparum is consistent with observations by George and Alexander,[19] who noted significantly lower platelet counts in falciparum malaria compared to vivax malaria.

Anemia was present in 55% of patients, with a mean hemoglobin of 11.24 ± 2.38 g/dL. This prevalence is comparable to that reported by Erhart et al.,[20] who found anemia in 51% of adult malaria patients in Vietnam. However, Muddaiah and Prakash [21] reported a higher prevalence of anemia (68%) in their study from southern Karnataka, which may be attributed to differences in nutritional status, baseline hemoglobin levels, and disease severity in their study population. Leukopenia was observed in 25% of patients in the present study, which is consistent with the reported range of 15–30% in most studies on adult malaria.

Hepatic involvement was a notable finding in the present study, with hyperbilirubinemia in 45% and elevated transaminases in 40% of patients. These findings are in agreement with Murthy et al.,[22] who reported hepatic dysfunction in 42% of malaria patients in their study from a tertiary center in Karnataka. The predominance of hepatic involvement among P. falciparum cases (57.1% with hepatic dysfunction) compared to P. vivax cases (16.7%) in the present study aligns with the established understanding of the pathophysiology of falciparum malaria, where hepatocyte injury results from parasitized erythrocyte sequestration, microcirculatory obstruction, and inflammatory cytokine release. Renal involvement was limited, with elevated creatinine in only 10% of patients, similar to the findings of Prakash et al.[23] from coastal Karnataka.

The mean duration of hospital stay was 5.20 ± 1.85 days, and all patients were discharged after clinical improvement, with no mortality recorded. This favorable outcome is likely attributable to the predominance of P. vivax infections, early presentation, timely diagnosis, and appropriate antimalarial therapy. Similar favorable outcomes have been reported by Kochar et al.[24] in their large prospective study from Rajasthan, where prompt diagnosis and treatment were associated with low mortality rates.

The present study has certain limitations that merit acknowledgment. The retrospective study design and small sample size (n=20) limit the generalizability of the findings and reduce the statistical power to detect significant differences between species groups. The reliance on existing medical records may have introduced information bias. The study was conducted at a single center, which may not fully represent the diversity of malaria presentation across the broader coastal Karnataka region. Future prospective studies with larger sample sizes and multi-center designs are recommended to validate these findings and explore additional prognostic parameters.

Conclusion

The present study demonstrated that malaria in coastal Karnataka was predominantly caused by Plasmodium vivax (60%), with a significant proportion of P. falciparum cases (35%). The disease predominantly affected young to middle-aged males with occupational exposure to outdoor environments. The clinical presentation was characterized by fever, chills and rigors, headache, and myalgia as the most common symptoms, with splenomegaly and hepatomegaly as frequent physical findings. Thrombocytopenia was the most common hematological abnormality, observed in

80% of patients, followed by anemia in 55% and leukopenia in 25%. Hepatic dysfunction, manifested as hyperbilirubinemia and elevated transaminases, was present in a substantial proportion of patients, particularly among those with P. falciparum infection. Complications including hepatic dysfunction, acute kidney injury, and cerebral malaria were more frequently associated with P. falciparum infection. All patients in the study had favorable clinical outcomes with no mortality, highlighting the importance of early diagnosis and timely initiation of appropriate antimalarial therapy. The findings of this study underscore the need for clinicians in endemic coastal regions to maintain a high index of suspicion for malaria in febrile patients, particularly those presenting with thrombocytopenia and hepatic dysfunction, and to initiate prompt laboratory evaluation and species-specific treatment. Future prospective studies with larger sample sizes are warranted to further characterize the clinical and hematological profile of malaria in this region and to identify predictors of disease severity.

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