

Research Article

A study of clinical profile and complication of malaria in a tertiary care centre in South-eastern region of Rajasthan, India

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ABSTRACT

Background: Malaria continues to be one of the important public health problems in India. As per World Health Organization report 2015, South East Asian Region bears the second largest burden of malaria (10%), only being next to African region (88%). The present study is aimed at to study clinical profile and complications, in a tertiary care hospital.

Methods: A total of 100 cases were included in the study that admitted at NMCH, Kota and identified positive for malaria parasites on peripheral smear examination with conventional microscopy and / or by rapid diagnostic test.

Results: predominant symptoms were fever (100%), vomiting (52%), headache (34%), myalgia (28%) and jaundice (27%) and signs were splenomegaly (75%), pallor (57%), icterus (28%), hepato-splenomegaly (19%), and hepatomegaly (04%). In this study, 82% patients suffered from uncomplicated malaria and 18% from complicated malaria.

Conclusions: Malaria is responsible for major health concern in South-eastern region of Rajasthan and is found to affect comparatively the younger adult population. *P. Vivax* was the major parasite type causing malaria and most of the complications were due to *P. falciparum*.

Keywords: *P. Vivax*, *P. Falciparum*, Complicated malaria, Fever, Splenomegaly

INTRODUCTION

Malaria continues to be one of the important public health problems in India. As per World Health Organization report 2015, South East Asian Region bears the second largest burden of malaria (10%), only being next to African region (88%). Malaria caused 214 million infections and 438000 deaths worldwide, most of them occurred in the Africa region (90%) followed by SEA Region (7%).¹ Among South-east Asia region, India shares two-thirds of the burden (66%) followed by Myanmar (18%) and Indonesia (10%).² The malaria situation remains a major problem in certain states and geographical pockets. The majority of malaria cases and deaths in India are being reported from Orissa, Rajasthan,

Jharkhand, Chhattisgarh, Madhya Pradesh and the Seven North Eastern states.³

Malaria is caused by protozoan parasite of genus plasmodium. Five species of the plasmodium *P. Falciparum*, *P. Vivax*, *P. Ovale*, *P. Malariae* and *P. Knowlesi* cause malaria in humans. Infection is initiated when sporozoites from the salivary glands of a female anopheles mosquito are inoculated during a blood meal into the human blood stream.⁴ The common clinical manifestation are fever with chills and rigors, headache, vomiting, jaundice and common sign being splenomegaly, pallor, and icterus.^{13,22-23} Hematological abnormality which is most commonly seen in malaria is thrombocytopenia followed by anemia. Both are seen

with all types of malaria but most commonly with *P. Falciparum* malaria.⁵

Severe manifestations with *P. Vivax* monoinfection are similar to those of severe *P. Falciparum* infection and include cerebral malaria with generalized convulsions and status epilepticus, severe anemia, hepatic dysfunction and jaundice, acute lung injury, ARDS and pulmonary edema, shock, splenic rupture, acute renal failure hypoglycaemia, hyperparasitaemia, cardiac arrhythmias, diarrhea and severe thrombocytopenia with or without bleeding from different part of the body.⁷⁻¹⁷

P. falciparum causes the most serious form of the disease. Infections with this parasite may become severe and fatal without early diagnosis and prompt and appropriate case management. Prompt action is especially important for high risk groups such as young children and pregnant women.¹⁸⁻¹⁹ Malaria has been a serious problem in some parts of the country due to the slow progress in its control. Lack of proper health infrastructure, inability to control the disease in endemic areas, and movement of the population are some of the factors responsible for failure to curb malaria. This prospective study is aimed at determining clinical presentation and complication of malaria in adult patient's admitted to present hospital over the one year.

METHODS

A randomized, prospective study was conducted in the Department of Medicine, New Medical College Hospital, Government Medical College, Kota, Rajasthan from January 2015 to December 2015. This study conducted in 100 malaria positive patients. A written informed consent was taken from each patients included in the study after thorough counseling. All cases were selected, taking into consideration the inclusion & exclusion criteria.

Inclusion criteria

All the cases were tested positive for malaria parasite and admitted at the medicine ward in the age group of 15 year and above were included.

Exclusion criteria

Patients presenting with fever (malaria smear negative), but treated empirically for malaria were excluded from the study and patients presenting with clinical features mimicking malaria (malaria parasite test negative), as in leptospirosis, dengue fever and sepsis had been excluded.

A detailed history and complete general and systemic examination was done for cases recruited in the study as per Performa. Following investigation was done Complete blood count (hematology autoanalyzersys max xs-800i), Peripheral blood film for cell morphology, thick and thin blood smear for malaria parasite and parasite count, specific malarial antigen test, dengue serology,

random blood sugar, urine examination, liver function test, renal function test, blood and urine culture and sensitivity, chest X-ray PA view, ultrasonography of abdomen.

All patients of *P. Falciparum* and *P. Vivax* malaria and mixed infection were treated with either Artesunate or Quinine-sulphate with Doxycycline or Clindamycin, depending upon the clinical severity. Primaquine was given for radical treatment as per malaria species. Statistical analysis was performed with the statistical package for the social science system version SPSS 17. Continuous variables are presented as mean±SD, and categorical variables are presented as absolute numbers and percentage. Nominal categorical data between the groups were compared using Chi-squared test. P-Value<0.05 was considered statistically significance.

RESULTS

Total of 100 patients were included in the study and following characteristic were seen. Age wise distribution of malaria cases in study population showed in Table 1. Maximum cases were in 21-30 years (38%) and minimum cases were in 61-70 years (06%) of age group. The mean age of cases was 37.9±12.67 years. Out of 100 cases 78 (78%) were males and 22 (22%) were females (Table 2). Among them 32% were *P. Falciparum*, 65% were *P. Vivax* and 03% were mixed infection (Table 3).

Table 1: Age distribution of malaria cases in study population.

Age Groups (years)	Number of cases	Percentage
21-30	38	38%
31-40	25	25%
41-50	21	21%
51-60	10	10%
61-70	06	6%
Mean±SD	37.9±12.67	

Table 2: Sex distribution of malaria cases in study population.

Sex	Number of cases	Percentage
Male	78	78%
Female	22	22%
Total	100	100%

Distribution of symptoms and signs in study population showed in Table 4. Fever was observed in 32 cases of *P. Falciparum*, 65 cases of *P. Vivax* and 3 cases of mixed infection, vomiting was seen in 24 cases of *P. Falciparum*, 25 cases in *P. Vivax* and 3 cases in mixed infection, headache in 19 cases of *P. Falciparum* and 13 cases in *P. Vivax* and 2 cases in mixed infection, jaundice in 16 cases of *P. falciparum*, 10 cases in *P. Vivax* and 1

mixed infection, impaired consciousness in 4 cases of *P. Falciparum* and none in *P. Vivax*, pain abdomen in 4 cases of *P. Falciparum* and 3 cases in *P. Vivax*, cough and breathlessness in 4 cases of *P. Falciparum* and 1 in *P. Vivax*, joint pain in 2 cases in *P. Falciparum* 3 in *P. Vivax*, myalgia in 12 cases of *P. Falciparum*, 13 cases in *P. Vivax* and 3 cases in mixed infection, oliguria in 8 cases of *P. Falciparum* and 2 cases in *P. Vivax*, diarrhoea in 11 cases of *P. Falciparum*, 9 cases in *P. Vivax*. Fever, nausea vomiting, headache, myalgia were the predominant symptoms. Common clinical signs in decreasing order were splenomegaly (75%), pallor (57%), icterus (28%), hepatosplenomegaly (19%), hepatomegaly

(04%), altered sensorium (04%), convulsion (04%) and petechiae (03%).

Table 3: Distribution of plasmodium species in study population

Types of species	Number of cases (n=100)	Percentage
<i>P. Falciparum</i>	32	32%
<i>P. Vivax</i>	65	65%
Mixed	03	3%

Table 4: Distribution of symptoms and signs in study population.

Characteristic	<i>P. Falciparum</i> (N=32)	<i>P. Vivax</i> (N=65)	Mixed infection (N=03)	Total	Percentage
Symptoms					
Fever	32 (100%)	65 (100%)	03 (100%)	100	100%
Vomiting	24 (75%)	25 (38.4%)	03 (100%)	52	52%
Headache	19 (59%)	13 (20%)	02 (66.6%)	34	34%
Myalgia	12 (37%)	13 (20%)	03 (100%)	28	28%
Jaundice	16 (50%)	10 (15.3%)	01 (33.3%)	27	27%
Diarrhoea	11 (34%)	09 (13.8%)	00 (00%)	20	20%
Oliguria	08 (25%)	02 (3.07%)	00 (00%)	10	10%
Pain abdomen	04 (12.5%)	03 (4.61%)	00 (00%)	07	07%
Cough & Breathlessness	04 (12.5%)	01 (1.53%)	00 (00%)	05	05%
Joint pain	02 (6.25%)	03 (4.61%)	00 (00%)	05	05%
Impaired consciousness	04 (12.5%)	00 (00%)	00 (00%)	04	04%
Signs					
Splenomegaly	22 (68.75%)	50 (76.92%)	03 (100%)	75	75%
Pallor	30 (93.75%)	24 (36.92%)	03 (100%)	57	57%
Icterus	19 (59.37%)	06 (9.25%)	03 (100%)	28	28%
Hepatosplenomegaly	09 (28.12%)	10 (15.38%)	00 (00%)	19	19%
Hepatomegaly	00 (00%)	04 (6.15%)	00 (00%)	04	04%
Altered sensorium	04 (12.5%)	00 (00%)	00 (00%)	04	04%
Convulsion	04 (12.5%)	00 (00%)	00 (00%)	04	04%
Petechiae	02 (6.25%)	00 (00%)	01 (33.33%)	03	03%

According to the revised WHO guidelines cases grouped into complicated and uncomplicated malaria. (WHO guideline for treatment of severe malaria, second edition 2010).²⁰ Out of 100 cases, 82 (82%) cases suffered from uncomplicated malaria and 18 (18%) from complicated malaria (Table 5). Among 100 cases of malaria, 09 (09%) cases had severe anemia (Hb<5gm%), of which 07 cases were associated with *P. Falciparum*, 01 case with *P. Vivax* and 01 case with mixed infection, 10 (10%) patients had serum creatinine>3mg% in which 07 cases were associated with *P. Falciparum* and 02 with *P. Vivax*, 01 with mixed infection and 09 (09%) cases had metabolic acidosis, of which 06 cases were associated with *P. Falciparum*, 02 with *P. Vivax* and 01 with mixed infection.

15 (15%) cases had raised bilirubin>3mg/dl, of which 11 were associated with *P. Falciparum*, 03 with *P. Vivax* and 01 with mixed infection. One case (1%) had coma for > 30min, which was associated with *P. Falciparum*. Six (6%) cases had hyper-parasitemia, in which 04 were associated with *P. Falciparum*, 01 with *P. Vivax* and 01 with mixed infection. 02 (2%) cases had hypoglycemia both were associated with *P. Falciparum*.

Four (4%) cases had prostration in which 03 were associated with *P. Falciparum* and 01 with mixed infection. Four (4%) cases had ARDS, all were associated with *P. Falciparum*. Seven (7%) cases developed shock (Systolic BP <80mmhg) in which 06 were *P. Falciparum* and 01 was mixed infection. Bleeding tendency as heavy

menstrual bleeding was reported in single case (1%) of *P. Falciparum* complicated malaria at the time of admission and platelet transfusion was done for her management. Complications were commonly seen in *P. Falciparum* as

compared to *P. Vivax* and mixed infection. This table suggests that complicated malaria was more commonly seen in *P. Falciparum* malaria.

Table 5: Distribution of complicated malariacases according to WHO guideline.

Criteria	No. of cases	Species		
		<i>P. Falciparum</i>	<i>P. Vivax</i>	Mixed
Hb <5gm/dl	9 (9%)	7 (7%)	1 (1%)	1 (1%)
Serum Creatinine >3mg%	10 (10%)	7 (7%)	2 (2%)	1 (1%)
Total Bilirubin >3mg/dl	15 (15%)	11 (11%)	3 (3%)	1 (1%)
Metabolic acidosis ph<7.2	9 (9%)	6 (6%)	2 (2%)	1 (1%)
Spontaneous bleeding	1 (1%)	1 (1%)	0 (0%)	0 (0%)
Coma >30min	1 (1%)	1 (1%)	0 (0%)	0 (0%)
Hyperparasitemia >5%	6 (6%)	4 (4%)	1 (1%)	1 (1%)
Blood sugar <40mg%	2 (2%)	2 (2%)	0 (0%)	0 (0%)
Prostration	4 (4%)	3 (3%)	0 (0%)	1 (1%)
ARDS	4 (4%)	4 (4%)	0 (0%)	0 (0%)
Systolic BP <80mmhg	7 (7%)	6 (6%)	0 (0%)	1 (1%)

Table 6: Association of malaria species with severity of malaria.

Species	Severity of malaria		Total
	Uncomplicated	Complicated	
<i>P. Falciparum</i>	18 (21.95%)	14 (77.77%)	32
<i>P. Vivax</i>	62 (75.61%)	03 (16.67%)	65
Mixed	02 (2.44%)	01 (5.56%)	03
Total	82 (100%)	18 (100%)	100

$\chi^2 = 22.74; P=0.0001.$

Association of malaria species with severity of malaria showed in Table 6. Uncomplicated malaria cases (82) were more associated with *P. Vivax* (75.61%) as compared to *P. Falciparum* (21.95%), whereas complicated malaria cases (18) were more associated with *P. Falciparum* (77.77%) as compared to *P. Vivax* (16.67%) and this was statistically significant (P=0.001).

DISCUSSION

This was a prospective study including 100 cases, admitted in the medicine wards at New Medical college Hospital, Kota. The results obtained were discussed as below.

In present study, a total of 100 malaria cases were studied, maximum number of cases (63%) were in between the age group of 15-40 years with the high incidence (38%) between the age group of 21-30 years. The mean age of the cases was 37.9±12.67. Similar study was done by Estacio RH et al who reported that most of their patients (30%) were in between 19-35years of age and Sudhirbabu et al reported 30% cases were in the age

group of 21-30 years of age and Maddhu et al reported 70% cases were in the age group of 21-30 years of age and Suryawa A et al also reported that maximum number of cases (64%) were in between the age group of 20-40 years with the high incidence (34.71%) between the age group of 20-30 years in their study. In present study and other similar study, there was mostly young and middle aged group patients were affected.²¹⁻²⁴ This may be due to young and middle aged group are being more active outdoors from dawn to dusk.

Present study includes 78 males (78%) and 22 females (22%). The present study is consistently similar to studies done by Maddhu et al had males 80.5% and females 19.5%, Preetam et al had males 75% and females 25%, Bezwada et al had males 76% and females 24% and G.VijayaKumaret al also noted males 76% and females 24% in their study.²³⁻²⁷ This indicates that the incidence of malaria is more common in males than females this is because males are more frequently exposed to the risk of acquiring malaria than females because of their outdoor life which they lead. Further,

female in India are usually better clothed than males, and hence they are less exposed.

Out of 100 cases 65 % had *P. Vivax* malaria, 32 % had *P. falciparum* malaria and 03 had mixed infection. The commonest species was *P. Vivax* (65%). Prevalence of *P. Vivax* malaria is common in India because of variations in climatic condition and breeding places of mosquito and genetic resistance of *P. falciparum*. Similar study was done by Madhu Muddaiah et al they reported that 52.54% of cases had suffered from *P. Vivax* species and 33.75 % cases suffered from *P. Falciparum*. Bikharamet al also reported similar results with 52% cases had *P. Vivax* infection and rest of 48% had *P. Falciparum* malaria. Later in 2015 Bezwada Rao et S al also supported the present study with similar results showing 61% cases suffering from *P. Vivax* malaria, 35% cases had *P. Falciparum* malaria and 4% had mixed infection.^{23,26,28}

In present study fever was the commonest clinical manifestation present in 100% cases followed by nausea vomiting in 52%, headache in 34%, myalgia in 28%, jaundice in 27%, diarrhoea in 20%, oliguria in 10%, pain abdomen in 07%, impaired consciousness in 04%, cough and breathlessness in 05% and joint pain in 5% cases.²³ Present study's results are nearly similar to study done by Gopinath VP et al reported fever in 97.8% and vomiting in 42.2%, headache in 69%, altered sensorium in 8.8% cases, Murthy GL et al who also reported fever with chills and rigor in 98.10%, altered sensorium in 48.10%, headache in 33.40%, diarrhoea in 18.35%, jaundice in 27.21% and oliguria in 6.96% cases, later Madhu Muddaiah et al noticed that fever was present in all cases (100%), nausea and vomiting in 37.36%, headache in 33.6%, jaundice in 15.78%, altered level of consciousness in 4.21% cases, and even Sudheer Babu Devineni et al also noted that fever was the most common symptom (100%) followed by vomiting in 22.22%, headache in 25.56%, jaundice in 15.56%, altered sensorium in 8.89%, pain abdomen in 7.77%, cough and breathlessness in 4.44%, and joint pain in 5.56%.^{22,23,29,30} So according to above mentioned studies and the present study commonest symptoms were fever, headache, vomiting and jaundice.

In present study maximum number of cases presented with splenomegaly 75 (75%) followed by anemia 57 (57%), icterus 28 (28%), hepatomegaly 04 (04%), hepatosplenomegaly 19 (19%), hypotension 7 (7%), impaired consciousness 04 (04%), convulsion 04 (04%) and petechiae 03 (03%).^{21,23}

Present study was nearly similar to study done by DebT et al who reported pallor in 65.6% cases, icterus in 5.7% cases, splenomegaly in 45.7%, hepatosplenomegaly in 25.6% cases, Madhu Muddaiah et al reported nearly similar results fever in 98%, pallor in 56%, icterus in 14.73%, hepatosplenomegaly in 13.6%, hepatomegaly in 4.2%, altered level of consciousness in 4.2%, raised bilirubin in 14.73% cases, Shahnaz Shahr, et al reported

pallor in 67.7%, splenomegaly in 70.9% cases, Preetam N Wasnik et al in also noticed that 65% subject had pallor, 35% had icterus, 30% had splenomegaly, 22.5% had hepato-splenomegaly and Sudheer Babu Devineni et al also reported that common clinical signs were splenomegaly (86%), pallor (46.6%), icterus (13.3%), hepatomegaly (10%), altered sensorium (8%), petechiae (6%).^{22,25,32}

According to above mentioned studies and the present study splenomegaly was the most common sign followed by pallor and icterus. A clinical spectrum of fever, splenomegaly and pallor is most often associated with malaria. Among 100 cases, 18 cases (18%) had complicated malaria and 82 cases (82%) had uncomplicated malaria. Present study was nearly similar to study done by Rao et BS al reported complicated malaria in 17 cases (18.89%) and uncomplicated malaria in 73 cases (81.11%).²⁶ In present and above study, uncomplicated cases were more than complicated cases because of *P. Vivax* species was common infection.

In present study among 100 cases of malaria, 09 cases (9%) had severe anemia (Hb<5gm%), of which 07 cases (7%) were associated with *P. falciparum*, 01 case (1%) with *P. vivax* and 01 case (1%) with mixed infection. Anemia results from accelerated RBC removal by spleen, obligatory RBC destruction at parasite schizogony and ineffective erythropoiesis. Splenic clearance of all RBCs is increased. In nonimmune individuals and in areas with unstable transmission, anemia can develop rapidly and transfusion is often required. Present study was nearly similar to study done by Nand N et al, Wasnik PN et al who reported severe anemia (Hb level <5 gm%) in 6 (7.5%) patients.²⁵

Ten cases had acute renal failure, among them serum creatinine>3mg% noted in 07 cases (7%) of *P. Falciparum* and 02 cases (2%) of *P. vivax* and 01 (1%) of mixed infection. One case required dialysis and other 9 were treated conservatively. Renal impairment was common among adults with severe falciparum malaria. Our study was nearly similar to study done by Wasnik PN et al who noticed 5 (6.25%) patients had severe renal impairment (serum creatinine>3 mg/dl), Kocher DK et al also noticed renal failure in 2.07% cases in their 2006 study and 6.25% in their study.^{18,25}

Some other studies suggested that *P. Vivax* can also cause renal dysfunction such as Prakash et al found that acute renal failure can occur in both *vivax* and *falciparum* malaria but more commonly in falciparum malaria and the prognosis of it in *vivax* malaria is favourable.¹⁶ Another study done by Kauret al found that unusual presentation of *vivax* malaria with severe thrombocytopenia and acute renal failure.¹⁴

In present study raised bilirubin >3mg/dl noted in 15 (15%) cases, of which 11 (11%) were associated with *P. Falciparum*, 03 (3%) with *P. Vivax* and 01 (1%) with

mixed infection. Present study was nearly similar to study done by Kochar DK et al who observed serum bilirubin more than 3mg/dl in 30% patients out of 60 cases, Maddhu Muddaiah et al noticed raised serum bilirubin in 28 (14.73%) cases.^{23,34} Wasniket PN et al also observed increased serum bilirubin in 28 (35%) cases and reported that mild hemolytic jaundice was common in malaria.²⁵ Severe jaundice associated with *P. Falciparum* infection is more common among adults than among children; and results from intravascular hemolysis of parasitic RBCs, hepatocytic injury, and an element of microangiopathic hemolysis due to DIC.²⁵ In this study four cases had altered sensorium and cerebral malaria. CSF analysis was done which was normal. 1 Patient developed coma >30min, which was associated with *P. Falciparum* and was put on mechanical ventilators, who died within 8 days of admission due to multi organ failure and cerebral malaria. There were no deaths in complicated *P. Vivax* malaria. Our study was nearly similar to study done by Madhu Muddaiah et al noticed that altered level of consciousness in 8 (4.21%) cases.²³

In present study 2 (2%) cases had hypoglycaemia both were associated with *P. Falciparum*. Hypoglycemia is important and common complication of severe malaria is associated with a poor prognosis and is particularly problematic in children and pregnant women. Hypoglycemia in malaria results from a failure of hepatic gluconeogenesis and an increase in the consumption of glucose by both host and, to a much lesser extent, the malaria parasites. Present study was similar to study done by Kocher DK et al who noticed hypoglycemia in 2.07% cases in their 2006 study and 1.56% in 2001 study and MK Mohapatra et al reported hypoglycemia in 2.1% cases.^{18,21} In present study hypotension (Systolic BP <80mmHg) was present in 7 (7%) cases, of which 06 (6%) were *P. Falciparum* and 01 (1%) was mixed infection. Nearly similar study done by Kochar DK et al noticed hypotension in 10.94% cases, Charulata et al reported hypotension in 4.85 % cases.^{18,35} Preetam N Wasniket et al reported 12 (15%) cases had systolic blood pressure <100 mm of mercury.²⁵ The majority of patients with severe malaria were febrile with high cardiac output, a low systemic vascular resistance and low normal blood pressure. 04% cases had ARDS, all were associated with *P. Falciparum*. Similarly Kocher DK et al reported ARDS in 3.01% cases.¹⁸

In present study we found that among 82 uncomplicated malaria cases, 62 (75.61%) were *P. Vivax*, 18 (21.95%) were *P. Falciparum*, 02 (2.44%) cases were mixed infection and out of 18 cases of complicated malaria, 14 (77.77%) were suffering from *P. Falciparum*, 03 (16.67%) from *P. Vivax* and 01 (5.56%) from mixed infection. These findings were comparable to study done by Sudheer Babu Devineni et al reported that *P. Falciparum* (58.8%) was more associated with complicated malaria whereas *P. Vivax* (66%) was more associated with uncomplicated malaria; Dharmesh Kumar N Patel et al found that complicated malaria was more

commonly caused by *falciparum* malaria and was rarely caused by other malarial parasites. Present study was also supported by Murthy GL et al, Mohapatra et al, Kocher et al, they all observed that *P. Falciparum* infection was to be predominantly associated with complicated malaria.^{19,22,30,32,36} Present and other studies showed that uncomplicated malaria cases were more associated with *P. Vivax* infection whereas complicated malaria was more associated with *P. Falciparum* infection. In present study statistically significant association was found between species of malaria parasite and severity of malaria.⁷

CONCLUSION

Malaria is responsible for major health concern in southeastern region of Rajasthan and is found to affect comparatively the younger adult population. *P. Vivax* was the major parasite type causing malaria and most of the complications were due to *P. Falciparum*. Early diagnosing and treating the complications immediately reduces the global burden of malaria.

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