

Research Article

Assessment of Complications of *Plasmodium falciparum* Malaria in Khammam District of AP

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Abstract: Malaria is a mosquito borne parasitic disease caused by the bite of female Anopheles mosquito. Globally it affects the tropics and sub-tropics. It is endemic in Khammam district of Andhra Pradesh. Out of the four Plasmodium species, *P. falciparum* is the leading cause of complications due to capillary infarcts, leakage and organ dysfunction. The study aims to study the incidence of complications of malaria and to study the response to treatment in complicated malaria. The study was conducted at Mamata General Hospital, Khammam. A total number of 50 patients who are proved "smear positive" and card test positive for *P. falciparum* are studied during the period of January 2013 to February 2014. All patients > 12 years who had a positive blood smear and rapid diagnostic test (card test) for Falciparum malaria in Mamata General Hospital, Khammam were included. Exclusion criteria include age <12 years patients, only gametocyte of PF, *P. vivax* smear positive and mixed smear positive, diagnosed cases of Malaria without complications. The most common complication as per our study is anemia, seen in 82% of cases, followed by jaundice (64%), respiratory distress (20%), cerebral malaria (18%), bleeding disorders (18%), ARF (12%), hypoglycaemia (6%), and there is good response to treatment with artemisinin combination therapy. 1 patient died due to multiple organ dysfunction.

Keywords: Malaria, jaundice, *P. falciparum*, complications

INTRODUCTION

Malaria is one of the most important parasitic diseases of human beings and is a common health problem in many developing countries including India where both children and adults are affected.

Malaria is caused by the Protozoan parasite of the genus Plasmodium. There are four Plasmodium Species- *P. falciparum*, *P. vivax*, *P. malariae*, *P. ovale* [1]. The parasite is transmitted from one person to another by an insect vector- the female Anopheles mosquito. It can also be transmitted by blood transfusions, trans placental spread or transplantation of a Malaria infected organ.

The clinical presentation is due to rupture of the RBC and subsequent release of Merozoites into the circulation. The patient commonly complains of fever, headache and pains elsewhere in the body. Occasionally abdominal pain and diarrhoea may be seen. Of the four species, *P. falciparum* causes most of the complications like Cerebral malaria, Hypoglycaemia, Acute renal failure, ARDS, Hemorrhage, black water fever and shock [2]. Unless the condition is promptly diagnosed

and treated, a patient with falciparum malaria deteriorates rapidly.

Malaria is endemic to the district of Khammam, Andhra Pradesh and this prospective study aims to study the complications of Falciparum malaria.

MATERIALS AND METHODS

Place of study: Mamata General Hospital, Khammam, A.P.

Study population: A total number of 50 patients who are proved "smear positive" and card test positive for *P.falciparum* are studied.

Study period: May 2012 – April 2013

All the patients were followed during the hospital stay and after discharge or till the outcome. The clinical diagnosis of falciparum malaria was suspected based on the Manson Bahr's criteria.

All patients of falciparum malaria with typical presentation of fever, chills and rigors, headache and a typical presentations like altered sensorium, seizure,

encephalopathy, acute respiratory distress syndrome, acute renal failure, black water fever, acute abdomen or algid malaria were included in the study.

Detailed history and clinical examination were done upon admission and following investigations were done and patients were followed up.

Peripheral smear and card test for falciparum malaria parasite were done from capillary/venous blood in all patients.

Staining was done by Giemsa/ Leishman/ Field staining.

Other investigation like Complete body picture for type of anaemia, haemoglobin percentage, leucocytes count, RBC Blood urea, serum creatinine, serum electrolytes, urine examinations, liver function test, ECG and chest X-ray (when required).

Lumbar puncture was done in indicated patients.

Inclusion Criteria

All patients > 12 years who had a positive blood smear and rapid diagnostic test (card test) for Falciparum malaria in Mamata General Hospital, Khammam

Exclusion Criteria

- Age <12 years patients
- Only gametocyte of PF
- *P. vivax* smear positive and mixed smear positive
- Diagnosed cases of Malaria without complications

RESULTS

Data is collected from Mamata General Hospital, Khammam, A.P. during the study period between May 2012 to April 2013. 50 patients who are smear positive for malaria and positive for p. falciparum by card test were studied and the following observations were made.

Sex Distribution

There are 30 (60%) male patients and 20 (40%) female patients in this study.

Table 1: Sex distribution

Gender	Total
Males	30 (60%)
Females	20 (40%)

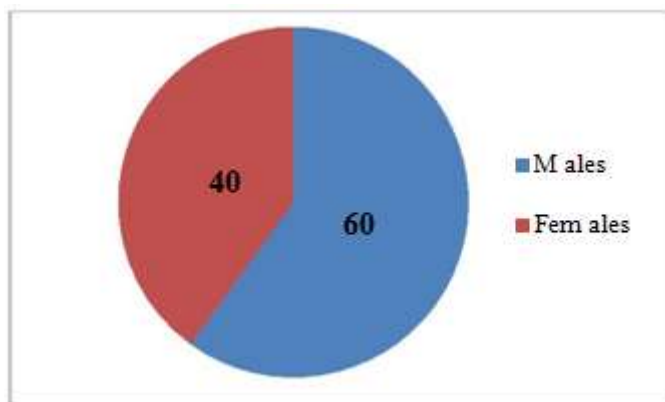


Fig. 1: Sex distribution

Age Distribution

Study group included age group from 12-80 years.

More number of cases was in the age group 21-30 years.

Table 2: Age distribution among cases

Age group in years	Total
12-20	7
21-30	12
31-40	8
41-50	11
51-60	9
61-70	2
71-80	1

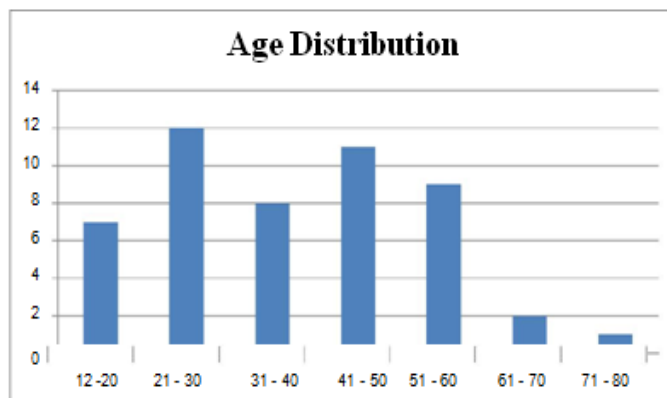


Fig. 2: Age Distribution

Symptomatology

Fever was seen in 100% of cases (50 patients), headache was seen in 88% of cases (Out of the 44

patients, 40 patients are complaining of intermittent headache, 4 patients are complaining of continues head ache).

Table 3: Symptomatology

Symptoms	Fever	Headache	Res. distress	Abd. pain	Gen. weak.	Alt. sens.	LOC	seizure	Nausea & vomiting
No. of patients	50	44	9	12	46	9	5	4	24

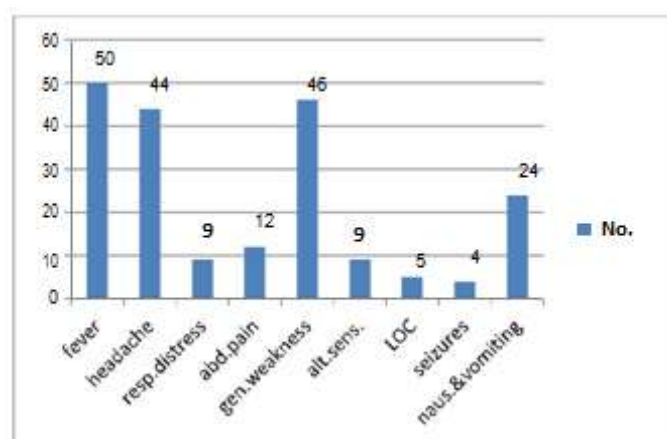


Fig. 3: Distribution of symptoms among study group

Signs in study group:

Anaemia

Found in 82% of cases (41 cases)

Table 4: Distribution of anaemia in study group

Anaemia Type	Total
Normocytic – normochromic	13
Microcytic – hypochromic	8
Dimorphic	3
Normocytic – hypochromic	17

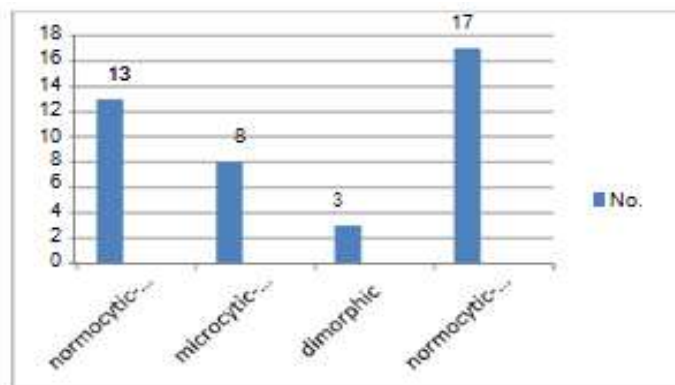


Fig. 4: Distribution of anaemia in study group

CNS complications

Delirium was found to be more common, seen in 9 cases.

Table 5: Distribution of CNS manifestations

CNS complication	Total
Delirium	9
LOC	5
Seizures	4
Signs of meningeal irritation	7

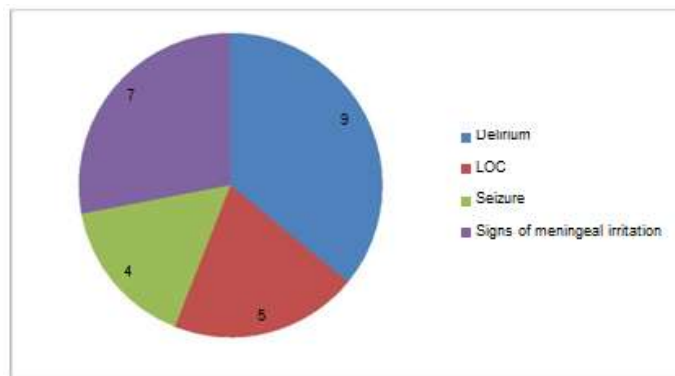


Fig. 5: Distribution of CNS complications

Bleeding disorders in study group

Table 6: Bleeding disorders in study group

Bleeding disorder	Total
Bleeding gums	6
Epistaxis	2
Hematemesis	1

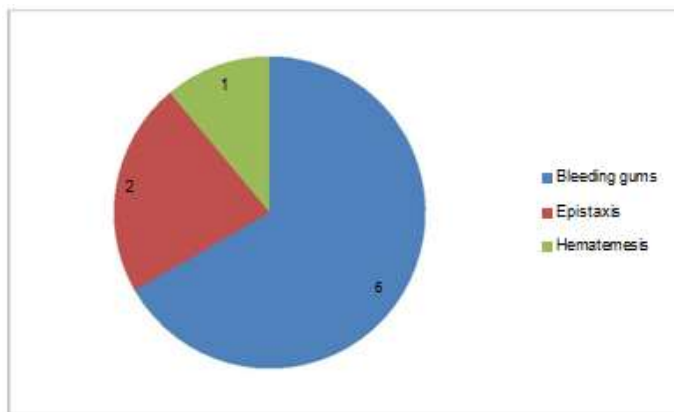


Fig. 6: Bleeding disorders in study group

Urinary output in study group

Table 7: Urinary output in study group

Urinary output	Total
Normal	30
Oliguria	8
Anuria	6

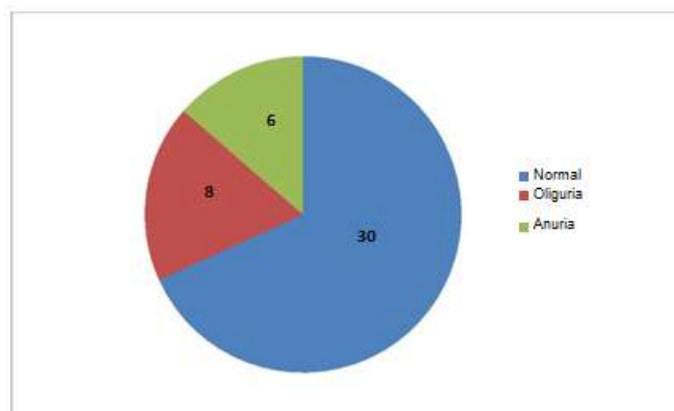


Fig. 7: Urinary output in study group

Other signs

- Jaundice was present in 32 of cases (64% cases)
- Splenomegaly was found in 32 patients and it was mild (4 – 7cms)
- Hepatomegaly was found in 17 patients.

Table 8: Other signs

Sign	Total
Jaundice	32
Splenomegaly	32
Hepatomegaly	17

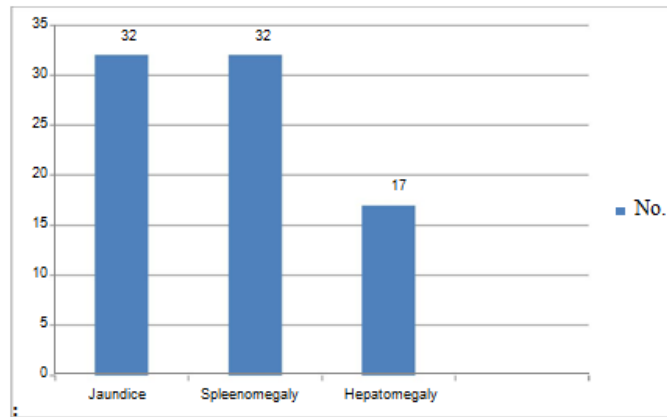


Fig. 8: Other signs

Other complications in study group

Table 9: Distribution of other signs in study group

Other complications	Total
Black water fever	5
Hypoglycaemia	3
ARF	6
Respiratory distress	10
Bleeding disorder	9

DISCUSSION

Khammam District in an endemic area for malaria and it is well known for falciparum malaria.

In our study we have observed that most of the people hail from the rural places. Majority of patients are farmers, followed by house wives .It has been observed in our study that most of the 80% of patients belong to low- socio economic strata.

The high incidence is probably because of poor basic health facilities, poor sanitation and closeness to vector transmission due to their occupation. 80% of patients hail from the rural places.

Age, Sex and Occupation

The male sex group showed increase in incidence than female sex group in our study, probably due to

vector contact. Of the 50 cases, 75% of patients belong to age group <50 years. It is more common in 2nd, 3rd and 4th decade, though it is equally distributed in all age groups. The younger age group is more effected mainly because of no or partial immunity to *P. falciparum* compared to population group

In our study, incidence of 80% cases of *P. falciparum* malaria was between June to September. Transmission is profoundly influenced by climate. The optimum conditions for transmission are between 20-30 degrees centigrade temperature. Atleast 60% Sporogony does not occur <16 degrees centigrade or >33 degrees centigrade.

Percentage of patients seen between June-September:

Table 10: Comparision of percentage of patients

Gupta R <i>et al.</i> [3]	Present Study
85% of the patients	80% of the patients

Symptomatology

In this study, all patients had h/o fever. Fever was intermittent in 84%, continuous in 12% and in the rest remittent type.

History of headache was observed in 88% of cases and out of these 84% had intermittent type of headache and rest continuous headache. The fever was associated with generalized weakness/malaise in 46 patients. Nausea and vomiting were observed in 24

patients.

Mental status

Altered sensorium was present in 9 patients and h/o seizure in 4 patients. It is attributed to various factors viz, hyperpyrexia, lacticacidosis, hypoglycaemia etc. The sequestration of parasites in the microvasculature of brain and the vital organs leads to altered sensorium and generalised convulsions.

Cerebral Malaria

The incidence of cerebral malaria in this study is 18% with variable involvement of other systems. Our

study hospital, being a referral centre, high incidence of cerebral malaria expected.

Table 11: Comparison of percentage of signs

Signs	Gopinathan VP et al. [4] (North East, 1981)	Mehta [5] (Agra, 1989)	Dhamija [6] (North East, 1989)	Bajiya [7] (Rajasthan, 1996)	Present study (2012- 2013)
Delirium	8.8%	3.05%	39.5%	64.80%	18%
Coma	5%	0.8%	3.2%	6.48%	10%
Headache	69%	100%	100%	72%	88%
Meningeal	25%	15%	20%	18.91%	14%

The reported incidence in endemic area is 3.4%. All the patients had fever. Headache, altered sensorium of variable intensity was present at the time of presentation. The study correlates with the study by Bajiya *et al.* [7] Rajasthan, where fever was seen in 100% patients, but altered sensorium in 30%, headache in 75%.

Meningeal signs were present in 14% compared to 18-75% in Rajasthan study and 25% in North-East study. Involvement of meninges and symmetrical encephalopathy is attributed to resetting in the microcirculation.

Anaemia was noticed in 41 patients, which was of moderate to severe.

Table 12: Comparison of percentage of tendencies

Tendencies	Gupta A <i>et al.</i> [3] (Rajasthan, 1987)	Mehta [5] (Agra, 1989)	Bajiya <i>et al.</i> [7] (Rajasthan, 1996)	Present study (2012- 2013)
Anemia	54%	83%	86.48%	82%
Haemorrhagic	21.8%	5.08%	18.6%	18%

In 50%, the pathogenesis is multifactorial to immune mediated (haemolytic) destruction of non parasitized RBCs and natural lysis of infected RBCs. Splenic clearance also contributed to the anaemia.

Anaemia was 86% in Bikaner [7], and 54% in study conducted by Gupta A *et al.* [3]. The mortality rate in

severe anaemia was 4.7% in report and 4.7% in cases with brain and lung complication

Abdomen

Liver was palpable in 17 patients, while Spleen was palpable in 32 patients

Table 13: Comparison of percentage of Hepatomegaly and Splenomegaly

	Gopinath <i>et al.</i> [4] (North East, 1986)	Mehta <i>et al.</i> [5] (Agra, 1989)	Bajiya and Kochar [7] (Rajasthan, 1996)	Present Study (2012 –2013)
Hepatomegaly	50%	75%	9.10%	34%
Splenomegaly	96%	70%	63%	64%

Table 14: Comparison of percentage of association with jaundice

	S.P Medical College [8] (Bikaner study, 1987)	BDS Medical Sciences [9] (Rohtak, 1997)	Present study (2012-2013)
Jaundice	30%	100%	64%

Clinically, 3 patients had acute gastroenteritis with pain abdomen. It is because of sequestration of parasites in the gut microcirculation causing visceral ischemia mimicking acute surgical abdomen with guarding, rigidity and shock associated with constitutional symptoms, which might have led to their complications.

Jaundice was the initial symptom in 64% of patients associated with fever, chills/rigors. It is due to haemolysis, hepatic microcirculation sequestration in

the liver during sporogony and cholestatic component due to obstruction in the microvascular blood flow to the liver.

In the BDS post graduate institution of medical sciences- Rohtak study [9], Jaundice was seen 10% of patients and hepatomegaly in 75%. In our study, 64% and 34 % patients had respectively jaundice and hepatomegaly.

Table 15: Comparison of percentage of ARF

	Mahakur <i>et al.</i> [10] (Beharampur, 1983)	Bajiya and Kochar [7] (Rajasthan, 1996)	Present study (2012-2013)
ARF	1.08%	5.40%	12%

While in study of complicated *Plasmodium falciparum* malaria in S.P medical college, Bikaner, Rajasthan [7], incidence of jaundice was 30% and hepatomegaly in 50% of cases which is close to our study. Prehepatic hyperbilirubinemia, high coloured urine and reduced in output was seen in 4 patients while majority of patients had normal urine output. While uremia was seen in 4 patients who died of multiorgan dysfunctions, 2 patients recovered from ARF.

Chest

Cough was found in 24% of patients. In the

Bikaner study [7], the incidence of ARDS was 7.02% compared to 10% in our study.

Hypoglycaemia

3 patients developed hypoglycaemia- 2 patients already being hypoglycaemic on admission and 1 during follow up in hospital, having developed hypoglycaemia probably as a complication of the disease and later recovered. Our study results correlate with an earlier study by Bajiya *et al.* [7] where severe hypoglycaemia was seen in 4.32% of cases.

Table 16: Complications of falciparum malaria in our study

Complications	No. of patients	Percentage
Anaemia	41	82%
Cerebral malaria	9	18%
Hypoglycaemia	3	6%
ARF	6	12%
ARDS	5	10%
Died	1	2%

Treatment

Table 16: Treatment

Drug	No. of patients	Percentage
Artesunate	4	8 %
Doxycycline+Artesunate	31	62 %
Clindamycin+Artesunate	15	30 %

Mortality

The mortality was very less in our study. Only 9 patients presented with cerebral malaria and multi organ dysfunction features with bleeding manifestation. The present study has less Mortality compared to 33.5% in a large study done in Bikaner, Rajasthan. Early diagnosis, anticipation of complications, close monitoring of vital parameters and combination therapy to overcome drug resistance perhaps helped to contain the extent of mortality in the study.

CONCLUSION

Khammam District is an endemic area for Malaria.

The incidence of *Plasmodium falciparum* malaria is maximum between June to Sept. Male patients were more in number in our study. Most of the cases were <50 years.

All patients presented with fever. Anaemia was found in 82 % of patients (moderate - severe) followed by Jaundice in 64%, Respiratory distress in 20%, Cerebral Malaria in 18%, Bleeding disorders in 18%, A.R.F in 12%.

There is a considerable decrease in morbidity in our study as compared to earlier studies probably due to higher potency of current anti-malarial drugs (Artemisinin derivatives).

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