

CLINICAL PROFILE OF FALCIPARUM MALARIA WITH SPECIAL REFERENCE TO ACUTE KIDNEY INJURY- A HOSPITAL-BASED OBSERVATIONAL STUDY

Bhaskar Baruah¹, Subhajit Mitra², Diganta Buragohain³

¹Associate Professor, Department of Medicine, Gauhati Medical College and Hospital, Guwahati, Assam, India.

²Registrar, Department of Medicine, Gauhati Medical College and Hospital, Guwahati, Assam, India.

³Postgraduate Trainee, Department of Medicine, Gauhati Medical College and Hospital, Guwahati, Assam, India.

ABSTRACT

BACKGROUND

Malaria is very frequent in our state and acute kidney injury is a frequent complication. The objectives of this study were to evaluate the clinical features of falciparum malaria and its impact on kidney functions and the short-term outcomes.

MATERIALS AND METHODS

This was a hospital-based observational study, where 120 falciparum cases were studied in detail in a period of one year. A detailed history, thorough clinical examination and relevant investigations were done in patients suffering from falciparum malaria. AKIN criteria were used to define acute kidney injury.

RESULTS

Fever was the most common clinical feature which was present in 100% of the patients and associated chills and rigors were seen in 95.8% cases. 70.83% cases were complicated (severe) falciparum malaria and rest of 29.16% cases were uncomplicated. Acute kidney injury was seen in 34.16% patients. About 46.4% patients were in stage 3 AKIN. 60.9% cases required haemodialysis. There was 13.33% mortality in our study due to falciparum malaria. Malarial AKI attributed to 24.39% of the mortality.

CONCLUSION

Among the complicated cases, most of the patients had malarial acute kidney injury and required haemodialysis. Majority of the AKI patients presented with oliguria and albuminuria. Mortality was higher in patients with acute kidney injury.

KEY WORDS

Falciparum Malaria, Acute Kidney Injury, AKIN Staging, Haemodialysis.

HOW TO CITE THIS ARTICLE: Baruah B, Mitra S, Buragohain D. Clinical profile of falciparum malaria with special reference to acute kidney injury- a hospital-based observational study. J. Evolution Med. Dent. Sci. 2018;7(24):2851-2854, DOI: 10.14260/jemds/2018/643

BACKGROUND

Malaria is the most important parasitic disease of the humans and most common cause of fever in tropical countries. Human malaria can be caused by all species of Plasmodium, but falciparum malaria has greatest clinical importance because of its life-threatening complications. Mortality rate is 6.4% when one or few organs fail, but increases to 48.8% with multiorgan failures.¹ The development of these complicated forms of falciparum malaria and also the mortality depend upon the immune status and virulence of the falciparum strain. Kidneys are one of the most commonly involved organs in falciparum malaria. In 1944, Spitz observed acute renal failure due to falciparum infection in soldiers during World War II. Acute kidney injury (AKI) is one of the most dreaded complications of severe falciparum malaria.² The overall prevalence of AKI in falciparum malaria varies between < 1 and 60% with the mortality rate up to 45%.^{2,3}

Mild proteinuria to severe azotaemia with metabolic acidosis are the usual renal complications. It may be oliguric or non-oliguric. AKI may be present as a component of multiorgan dysfunction or as a lone complication in which the prognosis is better. The clinical manifestation is attributed to diverse pathogenic interplay. Acute tubular necrosis and mild proliferative glomerulonephropathy are the major histologic changes. Progression to chronic kidney disease is rare.² Assam contributes more than 5% of total malaria cases in the country annually. Plasmodium falciparum accounts for 58-68% of the cases and the remainder are due to P. vivax. Malaria is spreading to new areas, where there is enhanced morbidity and mortality. 122 primary health centres in Assam are identified as being high risk for malaria based on the selected epidemiologic criteria and nearly 65% of the total population of the state (26.6 million) is estimated to be living in high-risk areas. The number of malaria deaths in Assam in 2012 was 13, which came down to 7 in 2013 and 11 in 2014.⁴ Gauhati Medical College and Hospital renders services to the population of Assam and the neighbouring few districts of Arunachal Pradesh, Nagaland and Manipur and Meghalaya. Therefore, the study titled "Clinical profile of falciparum malaria with special reference to acute kidney injury" was undertaken on clinical presentations, complications and renal profile among the confirmed cases of falciparum malaria with the following aims and objectives-

- To study the clinical features of falciparum malaria.
- To study its impact on kidney functions.
- To study the short-term outcome.

'Financial or Other Competing Interest': None.
Submission 23-04-2018, Peer Review 27-05-2018,
Acceptance 02-06-2018, Published 11-06-2018.

Corresponding Author:

Subhajit Mitra,

Department of Medicine,

Gauhati Medical College and Hospital,

Guwahati,

Assam, India.

E-mail: subhajitrocks@gmail.com

DOI: 10.14260/jemds/2018/643



MATERIALS AND METHODS

Study Area

This study was conducted at Gauhati Medical College and Hospital, Guwahati, Assam. 120 adult patients of smear positive falciparum malaria with various complications were admitted to Department of Medicine and Nephrology.

Study Design

This was a hospital-based observational study from 1st June 2014 to 30th May 2015. Informed consent was obtained. Ethical committee clearance was taken. Data which included demographic profile, clinical features, investigations, treatment and complication from all indoor patients were collected and analysed. WHO criteria for severe falciparum malaria was used.⁵ AKIN criteria was used for acute kidney injury.⁶

Inclusion Criteria

All positive for falciparum malaria (either by peripheral smear or rapid diagnostic test) and above 12 years were included.

Exclusion Criteria

Acute kidney injury due to other diseases like infectious diarrhoea, dengue fever, typhoid, leptospirosis, patients with pre-existing renal diseases patients on nephrotoxic drugs were excluded from the study.

Method of Data Collection

1. Interviewing patients and attendants.
2. By thorough physical examination.
3. Relevant investigations.

Data were recorded into a preformed and pretested proforma. Statistical analysis was done by MS Excel 07 and GraphPad InStat software. P < 0.05 was considered significant.

RESULTS

In our study 101 patients (84.16%) were male and 19 (15.84%) were female (Figure 1). The male-to-female ratio was 5.3: 1. Out of 120 patients, 35 (29.16%) patients had uncomplicated falciparum malaria and 85 patients (70.83%) had presented with complicated falciparum malaria. Maximum number of patients 50 (41.6%) were in age group of 21 - 30 years followed by 28 (23.3%) in 13 - 20 and 31 - 40 age group (Figure 2).

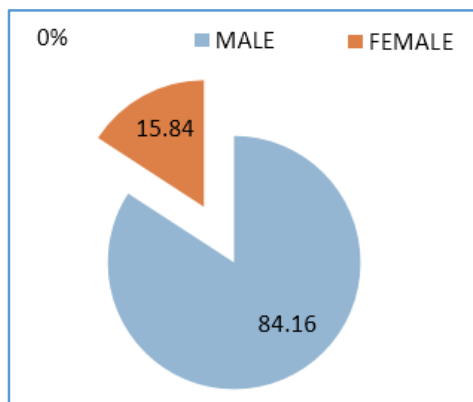


Figure 1. Sex Distribution

Fever was present in 100% of cases. 59 patients (49.16%) had headache and altered sensorium in 45 patients (37.5%). 12 patients (10%) presented with convulsions and loose motions. 25 patients (20.8%) had respiratory distress and 25 patients (20.8%) had decreased urine output. Bleeding manifestations was seen in 4 patients (3.30%) (Table 1).

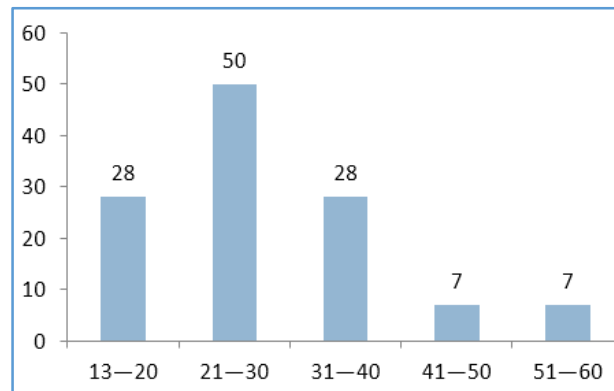


Figure 2. Age Distribution of Patients

Symptoms	Number of Cases	Percentage (%)
Fever	120	100
Chill and Rigor	115	95.80
Nausea and Vomiting	62	51.60
Headache	59	49.16
Altered Sensorium	45	37.50
Convulsion	12	10
Loose Motion	12	10
Respiratory Distress	25	20.80
Oliguria (< 400 mL in 24 hrs.)	25	20.80
Bleeding Manifestation	4	3.30

Table 1. Clinical Symptoms of Patients admitted in Hospital

Physical Sign	Number of Cases	Percentage (%)
Pallor	57	47.50
Icterus	52	43.33
Dehydration	28	23.30
Hypotension	17	14.16
Oedema	19	15.83
Hepatomegaly	52	43.33
Splenomegaly	81	67.50
Basal Crepitation	16	13.33
Acidotic Breathing	25	20.83

Table 2. Physical Sign

In our study 57 (47.5%) subjects had pallor, 52 (43.33%) had icterus, 17 (14.16%) had systolic blood pressure < 100 mmHg, hepatomegaly was observed in 52 (43.33%), splenomegaly was present in 81 (67.5%). Respiratory sign (crackle) was observed in 16 (13.33%), while 25 (20.8%) subjects had acidotic breathing (Table 2).

Out of 120 subjects, 85 (70.83%) patients suffered from severe falciparum malaria (Table 3). 43(35.83%) patients had cerebral malaria. Jaundice was present in 52 (43.33%) patients and 41 (34.16%) patients had acute kidney injury (Table 4). 8 (6.67%) patients had severe anaemia (Hb < 5 gm/dL).

Manifestations	Number of Cases	Percentage (%)
Jaundice (S. bilirubin > 3 mg/dL)	52	43.33
Cerebral Malaria	43	35.83
Acute Kidney Injury	41	34.16
Pulmonary Oedema	16	13.3
Bleeding Manifestation	4	3.33
Severe Anaemia (Hb < 5 gm%)	8	6.67
Hypoglycaemia	4	3.33

Table 3. No. of Cases of Severe Falciparum Malaria

Pattern of renal involvement showed that 33.33% had albuminuria. The serum creatinine was in the range of 1.5-18 mg/dL and blood urea was 88-445 mg/dL. Among the AKI patients, 20.83% had oliguric and 13.33% had non-oliguric renal failure (Figure 3). Most of the patients were in AKIN stage 3 (46.4%). Renal replacement therapy was required in 25 (60.9%) cases (Figure 4).

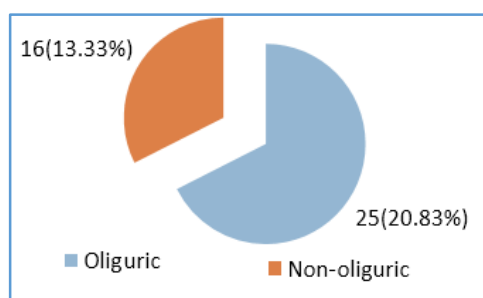


Figure 3. Distribution of Oliguric and Non-Oliguric Kidney Injury

Category	Number of Cases	Percentage (%)
No Kidney Injury	79	65.84
Acute Kidney Injury	41	34.16
Total	120	100.00

Table 4. Incidence of Acute Kidney Injury in the Study Subjects

Stage	Number of Cases	Percentage (%)
1	11	26.8
2	11	26.8
3	19	46.4
Total	41	100.00

Table 5. AKIN Stage of Patients

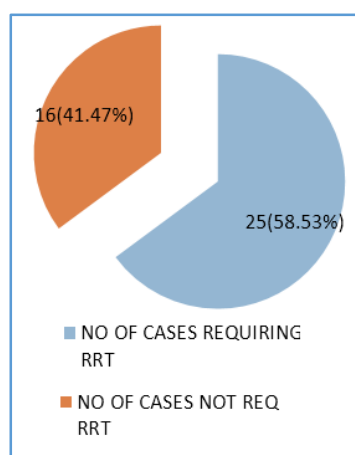


Figure 4. Requirement of Renal Replacement Therapy

Overall, mortality among 120 cases of falciparum malaria was 13.33% (16 patients). Mortality due to malarial AKI was 24.39%, though it was not statistically significant ($p > 0.05$).

DISCUSSION

In this study, males were the most affected 101 patients (84.16%) and females only 19 (15.84%). The male-to-female ratio was 5.3: 1.

Most of the patients were in the age group of 21 - 30 yrs. followed by 28 (23.3%) in 13 - 20 and 31 - 40 age group. Remaining 7 (5.8%) were found in the age group of 41 - 50 and 51 - 60. Mean age of the patients were 29.03 ± 10.71 SD.

Fever was the most common symptom. Jaundice was observed in 52 (43.33%) patients. Two studies also reported similar findings.^{7,8} Jaundice in falciparum malaria is due to intravascular haemolysis of parasitized RBCs, hepatic dysfunction and microangiopathic haemolysis due to DIC.⁹

Cerebral malaria was detected in 43 patients (35.83%). Three studies from India also reported similar findings.^{10,11,12} Anaemia was observed in 57 (47.5%) patients in our study, out of which severe anaemia was present in 8 (6.67%) cases. Two studies also reported similar incidence of severe anaemia.^{13,14}

The incidence of complicated falciparum malaria was 70.83% (85 cases). Our incidence was higher than three other studies.^{8,11,15} This is because falciparum malaria is endemic in North East India.

Incidence of AKI was 34.16% (41 patients) in our study. Mahakur AC and Mohanty S also reported similar findings in their study.^{16,17} However Sitprija V, Murthy G and Gupta BK reported lower incidence of AKI in their study.^{10,12,18} Krishnan reported higher incidence of AKI (89%) in his study.¹

Oliguric kidney injury was more common (20.83%) than non-oliguric injury in our study (13.33%). Gupta BK et al (2012) and Mohapatra MK et al (2012) reported 24.3% and 20.8% cases of oliguria in their study patients. However, higher incidence was reported by Mannan JA et al (2006), who found 76.09% of oliguric malarial kidney injury and Shukla VS et al (2013) observed 44.6%.

25 patients (60.9%) out of 41 malarial AKI needed haemodialysis, while 16 patients did not require dialysis. 16 patients expired out of 120 cases of falciparum malaria taking the mortality rate to 13.33% in our study. 10 patients out of 41 malarial AKI died. So, mortality due to malarial AKI in our study was 24.39%.

In our study mortality due to malarial AKI (24.39%) was higher than overall mortality (13.33%), which was not statistically significant. Shukla VS also reported that severity of renal dysfunction was not associated with mortality risks.¹⁹ The mortality was higher in patients in AKIN stage 3 (36.84%) than in stage 2 and 3 (18.18% and 9.09%) respectively.

CONCLUSION

In the present study, most patients presented with fever and majority had severe malaria. Among the complicated cases, most of the patients had malarial acute kidney injury and required haemodialysis. Majority of the malarial AKI patients presented with oliguria and albuminuria. Mortality was higher in patients with acute kidney injury, and was even more in haemodialysed patients, though it was not statistically significant.

REFERENCES

- [1] Krishnan A, Karnad DR. Severe falciparum malaria: an important cause of multiple organ failure in Indian intensive care unit patients. *Crit Care Med* 2003;31(9):2278-84.
- [2] Mishra SK, Das BS. Malaria and acute kidney injury. *Semin Nephrol* 2008;28(4):395-408.
- [3] Kanodia KV, Shah PR, Vanikar AV, et al. Malaria induced acute renal failure: a single center experience. *Saudi J Kidney Dis Transpl* 2010;21(6):1088-91.
- [4] National Vector Borne Disease Control Program, Malaria Situation in India. Annual Report 2014-15.
- [5] World Health Organisation. Guidelines for treatment of malaria. 2nd edn. Geneva: World Health Organization 2010.
- [6] Mehta RL, Kellum JA, Shah SV, et al. Acute kidney injury network: report of an initiative to improve outcomes in acute kidney injury. *Crit Care* 2007;11(2):R31.
- [7] Ali H, Ahsan T, Mahmood T, et al. Parasite density and the spectrum of clinical illness in falciparum malaria. *J Coll Physicians Surg Pak* 2008;18(6):362-8.
- [8] Malhotra Y, Pant BP, Khare RL, et al. Study of severity assessment and risk stratification of falciparum malaria in terms of hospital mortality in adults. *Journal of Evolution of Medical and Dental Sciences* 2015;4(61):10648-56.
- [9] Srivastava A, Khanduri A, Lakhtakia S, et al. Falciparum malaria with acute liver failure. *Trop Gastroenterol* 1996;17(3):172-4.
- [10] Murthy GL, Sahay RK, Srinivasan VR, et al. Clinical profile of falciparum malaria in a tertiary care hospital. *J Indian Med Assoc* 2000;98(4):160-2.
- [11] Mohapatra MK, Dash LK, Barik PK, et al. Profile of mixed species (*Plasmodium vivax* and *falciparum*) malaria in adults. *J Assoc Physicians India* 2012;60:20-4.
- [12] Gupta BK, Nayak KC, Kumar S, et al. Oliguric and non-oliguric acute renal failure in malaria in west zone of Rajasthan, India-A comparative study. *Journal of Acute Disease* 2012;1(2):100-6.
- [13] Kochar D, Kochar SK, Agrawal RP, et al. The changing spectrum of severe falciparum malaria: a clinical study from Bikaner (northwest India). *J Vector Borne Dis* 2006;43(3):104-8.
- [14] Mohapatra MK. The natural history of complicated falciparum malaria--a prospective study. *J Assoc Physicians India* 2006;54:848-53.
- [15] Wasnik PN, Manohar TP, Humaney NR, et al. Study of clinical profile of falciparum malaria in a tertiary referral centre in Central India. *J Assoc Physicians India* 2012;60:33-6.
- [16] Mahakur A, Panda SN, Nanda BK, et al. Malarial acute renal failure. *J Assoc Physicians India* 1983;31(10):633-6.
- [17] Mohanty S, Mishra SK, Pati SS, et al. Complications and mortality patterns due to *plasmodium falciparum* malaria in hospitalized adults and children, Rourkela, Orissa, India. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 2003;97(1):69-70.
- [18] Sitprijia V, Vongsthongsri M, Poshyachinda V, et al. Renal failure in malaria: a pathophysiologic study. *Nephron* 1977;18(5):277-87.
- [19] Shukla VS, Singh RG, Rathore SS. Outcome of malaria-associated acute kidney injury: a prospective study from a single center. *Ren Fail* 2013;35(6):801-5.