MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2024.8.576.580

Exploring the Dynamics of Plasmodium Falciparum Infection: Incidence, Clinical Presentations, Complications and Therapeutic Responses

[1]Jatin Jitendra Bamania, [2]Jugal Tarunkumar Chavda, [3]Shaily Rakholiya, [4]Sunil Tyagi and [5]Paranshi Desai

[1]Department of Emergency Medicine, Kiran Medical College, Surat, Gujarat, India

[2,3]SMIMER Medical College and Hospital, Surat, Gujarat, India

[4]Consultant Physician, Ahmedabad, Gujarat, India

[5]Department of General Medicine, Naresh Hospital, Ahmedabad, Gujarat, India

OPEN ACCESS

Key Words
Plasmodium falciparum malaria, clinical features, complications, treatment, peripheral smear

Corresponding Author
Sunil Tyagi,
Consultant Physician, Ahmedabad, Gujarat, India
tyagisunil1961@gmail.com

Author Designation
[1]Assistant Professor
[2,3]Final Year MBBS Student
[4]Consultant Physician
[5]Medical Officer

Received: 1 July 2024
Accepted: 7 August 2024
Published: 11 August 2024

Citation: Jatin Jitendra Bamania, Jugal Tarunkumar Chavda, Shaily Rakholiya, Sunil Tyagi and Paranshi Desai, 2024. Exploring the Dynamics of Plasmodium Falciparum Infection: Incidence, Clinical Presentations, Complications and Therapeutic Responses. Res. J. Med. Sci., 18: 576-580, doi: 10.36478/makrjms. 2024.8.576.580

ABSTRACT

Falciparum malaria can progress rapidly, as a part of complications major organ system dysfunction such as cerebral malaria. The risk of death is 20% even with proper therapy. This rapid progression to complicated malaria is most common in those without immunity, such as children in the tropics or traveller from temperate zones. The present study was carried at the Medical Ward of the tertiary care hospital, to find out incidence of P falciparum malaria, with typical and atypical presentation, and therapeutic response. Clinical study of 50 adult cases of Plasmodium Falciparum malaria has been carried out at tertiary care hospital with prior approval. Data was collected for one year. All the cases of Plasmodium Falciparum positive on peripheral smear examination were included in this study. In a study on Plasmodium falciparum malaria: The highest incidence was in the 21-30 age group (34%) followed by the 41-50 age group (18%). Out of 50 patients, 72% were male and 28% were female. Complicated cases accounted for 54%, with a higher proportion in males (40%) compared to females (14%). Common symptoms included fever (100%), vomiting (56%), nausea (54%), body ache (46%) and headache (44%). Splenomegaly was present in 38% of cases, mostly mild (63.15%), while hepatomegaly was observed in 8%. Anemia was present in 36% of patients, with 22% having moderate anemia. Complications were seen in 54% of patients, with cerebral malaria (18%), convulsions (12%), hyperpyrexia (10%), hypoglycemia (10%) and pregnancy-related complications (14%) being the most common. The study on Plasmodium falciparum malaria highlighted a higher incidence in the 21-30 age group, with males being more affected than females. Complicated cases were prevalent, with common symptoms including fever, vomiting and nausea. Complications such as cerebral malaria, convulsions and hypoglycemia were observed in a significant portion of patients. Further attention to early diagnosis and management strategies for severe manifestations, especially in high-risk age groups, is crucial for improving patient outcomes and reducing complications associated with Plasmodium falciparum malaria.

INTRODUCTION

Malaria in the world's most important parasitic infection of human beings affecting more than 40% of world's population (over 2.5 billion people) in about 103 endemic countries and causing 3 million death each year[1-4]. Although it has been eradicated from temperate zones, increasing number of travellers from temperate areas each year visit tropical countries where the disease remains a major cause of morbidity and mortality[3-6]. In India, vivax malaria is still prevalent in all endemic areas and more or less evenly distributed. The Falciparum malaria predominates in fort hills and forest areas[5,7-8]. The most intensive foci being observed in the North- Eastern states and Orissa, contributing more than 60% of total falciparum cases. Falciparum malaria can progress rapidly, with lucid patient becoming obtunded in minutes if major organ system dysfunction such as cerebral malaria develops[8-10]. The risk of death is 20% even with proper therapy. This rapid progression to complicated malaria is most common in those without immunity, such as children in the tropics or traveller from temperate zones[4-10].

Therefore, the present study was carried at the Medical Ward of the tertiary care hospital to find out incidence of P falciparum malaria, with typical and atypical presentation and therapeutic response.

MATERIALS AND METHODS

Clinical study of 50 adult cases of Plasmodium Falciparum malaria has been carried out at tertiary care hospital with prior approval. Data was collected for one year. All the cases of Plasmodium Falciparum positive on peripheral smear examination were included in this study.

Inclusion Criteria: Age more than 18 years of patient. Presence of asexual stage of Plasmodium Falciparum on peripheral smear examination. All OPD patients having CNS symptoms with positive Plasmodium Falciparum smear were admitted.

Exclusion Criteria: All paediatric and pregnant patients were excluded. Patients with mixed infestation of Plasmodium Vivex and Plasmodium Falciparum were excluded. No evident primary metabolic cause from history, clinical examination and laboratory investigations. In all cases detail history and thorough physical examination was carried out.

Peripheral Smear Examination: Both thick and thin smears were prepared at the time of admission before administration of antimalarial. Smear was stained with Jaspal Singh Bhattacharya 1 and 2 stain, examined thoroughly for malarial parasite at Ward laboratory, and confirmed. Repeated smear examination was done to notice the level of parasitemia and when the response to therapy was inadequate. Parasitemia was expressed as +, ++, +++ and ++++ using the following criteria in thick smear examination.

All patient admitted in hospital treated with WHO guidelines for malaria for chloroquine sensitive or resistant cases. Patients were constantly observed for complication like intravascular hemolysis acute renal failure, pulmonary edema, secondary infection Patients were advised to come for follow-up at weekly interval to notice any relapse.

RESULTS AND DISCUSSIONS

In present study, maximum cases of Plasmodium Falciparum malaria were present in age group 21-30 years (34%) followed by age group between 41-50 year (18%). In our study out of 50 patients 36 (72%) are male and 14 (28%) are female. Incidence of complicated cases were 54% in which 40% were male and 14% were female. In present study, intermittent fever was recorded in 54% case and high-grade fever in 16% of cases. In present study, commonest symptoms were fever (100%), vomiting (56%), nausea (54%), body ache (46%) and headache (44%). In, present study, incidence of splenomegaly was 38% in which majority of patients had mild splenomegaly (63.15%). Incidence of hepatomegaly was 8% in present study in the present study, the commonest physical signs were splenomegaly (38%), pallor (36%) and coated tongue (12%). In the present study, incidence of anemia was 36% in which 22% patients had moderate anemia (5-9 gm%). 20% of patients had high parasitic index associated with severe and complicated manifestation of Plasmodium Falciparum malaria. Out of 50 patients, 27 patients had complications. Some patients had more than 1 complication. Therefore, 54% patients had complicated malaria. The most common complications in the present study were cerebral malaria (18%), convulsion (12%), hyperpyrexia (10%), hypoglycemia (10%) and complication during pregnancy (14%).

All patients were treated first with chloroquine, if not responded sulfadoxin + pyrimethamine was given; if no response was noted, quinine was given. In above study of 50 cases, 20 cases (40%) responded to chloroquine. Most of the cases who did not respond to chloroquine were complicated cases (20 out of 28 patients-71.42%). 7 cases out of 16 (43.75%) responded to sulfadoxine and pyrimithamine protocol. Other cases (16 out of 23 patients - 88.89%) responded to quinine in present study. 7 patients (14%) died in which 2 (22.22%) died due to cerebral malaria.

In present study, maximum number of cases (34%) were reported in the 3rd decade of life. The lowest incidence (14%) was in the patients aged >50 years. This may be due to acquired immunity against malaria by repeated infection.

In present study incidence of male was 72% as compared to the study of S.S. Sabarwal (78%)[9].

Table 1: Expression of Parasitemia

Grade	No. of parasites
+	1-10 per 100 thick film field
++	11-100 per 100 thick film field
+++	1-10 per I thick film field
++++	>10 per I thick film field

Table-2: Sex Incidence

Sex	S.S. Sabrawal series (Bokaro) (%)[9]	Present study (%)
Male	78	72
Female	22	28

Table-3: Analysis of Symptomatology

Symptoms	Gerald S Murphy study (1996)[10] (in temperate zone %)	Percentage study %
Fever	97	100
Vomiting	36	58
Nausea	31	54
Bodyache	71	48
Headache	86	44
Loss of appetite	-	42
Sweating	71	28
Altered sensorium	21	26
Giddiness	-	18
Cough	18	14
Abdominal pain	2	14
Breathlessness	-	14
Convulsion	2	12
Yellowish discoloration of sclera & urine	7	8
Diarrhoea	18	8
Red or black urine	-	4
No urine output	-	4

Table-4: Analysis of Physical Signe in Plasmodium Falciparum Malaria

Symptoms	Gerald S Murphy study (1996)[10] (in temperate zone %)	Percentage study %
Splenomegaly	26	38
Anemia	28	36
Hepatomegaly	11	8
Icterus	2	2

Table-5: Manifestations of Severe and Complicated Plasmodium Falciparum Malaria

Complication	R. Gogia (Meerut) %[1]	T.V. Arya (Chandigarh) %[6]	A. Gupta (Chandigarh) %[3]	S. Sabarwal (Bokaro) %[9]	Present study	
					%	N
Cerebral malaria	-	-	-	-	18	9
Hyperpyrexia	-	-	-	-	10	5
Hypoglycemia	-	-	-	-	8	4
Abortion	-	-	18	-	28.5	
Premature labour and stillbirth	-	66.79	-	-	42.8	
ARF	-	47.6	9.0	5.0	6	
Hepatic impairment	8.7	-	-	-	4	
Hypotension	-	9.5	-	3.0	4	
ARDS	-	-	-	-	2	
Algid Malaria	8.7	-	-	-	2	
DIC	-	19.0	-	-		
Black water malaria	8.7	-	-	-	2	

Table-6: Incidence of Cerebral Malaria

Author	Sample	No. of Falciparum cases	No. of Cerebral Symptoms	Incidence
Hornn and Kerelitz[11]	US troops, mediterranea theatre	397	6	1.50
Huges and Bomford[11]	British troops, Africa	846	2	0.25
S.S. Sabharwal[9]	Kiriburu Hospital Bokaro	200	17	8.50
Present study	New Civil Hospital, Surat	364	9	2.41

Table-7: Analysis of Laboratory Investigation

Laboratory Value	Gerald S Study[10]	Present study
Anemia	28	38
Leukopenia < 400/U1	13	34
Leucocytosis	8	4
Hyperparasitemia (+++ & ++++ on P/S)	-	20
Proteinuria >++	13	10
Elevated asparatate aminotransferase (SGPT) level > 40 IU	25	8
Elevated (Blood urea N2 > 40 mg/dl)	20	6
Elevated alkaline phosphatase (>115 IU)	19	-
Elevated creatinine > 1.2 mg/dl	14	6
CSF exam (abnormal cell)	-	0
(no abnormal cells)		
Thrombocytopenia (PC < 1.0 lacs)	-	4
Fundus (Retinal haemorrhage)	-	2
Blood sugar (< 60 mg)	-	8
ECG (hypokalaemia changes)	-	4

Table-8: Mortality

Cause of mortality	No. of cases	Percentage
Cerebral malaria	2	4
ARF with hepatic impairment	2	4
DIC	1	2
ARDS	1	2
Black water fever	1	2
Total	7	14

Incidence of female was 28% as compared to the study of S.S. Sabarwal (22%). Male: female ratio was 2.8:1[9]. In present study, the highest incidence (44%) of malaria positive cases was seen in September to December. This may be explained on the basis of optimum temperature, humidity, rainfall and increased breeding places, in which mosquito survives. Lowest incidence (16%) was found during December to February.

In present study, incidence of fever was about 100% as compared to the study of Gerald S. Murphy (97%). Incidence of vomiting was 58%, nausea 54%, bodyache 48%, headache 44%, sweating 28% as compared to the study of Gerald S. Murphy where the corresponding figures were 36%, 31%, 71%, 86% and 71% respectively. Thus, GIT symptoms were more common in the present study as compared to generalised constitutional symptoms as noted by Gerald S. Murphy.

In present study, altered level of consciousness was found in 26% due to cerebral malaria (18%) and of hypoglycemia 8% as compared to the study of Gerald S. Murphy (2%). Incidence of diarrhoea (8%), yellowish discoloration of sclera and urine (8%), red or black urine (2%) and no urine output (2%) was found low in the present study.

In present study, incidence of splenomegaly was 38% as compared to 26% in Gerald S. Murphy's study. Anemia was found in 36% cases, hepatomegaly in 8% and icterus in 2% cases as compared to 28%, 11% and 2% respectively in Gerald S. Murphy's study.

In present study, incidence of cerebral malaria was 18%, hyperpyrexia 10%. hypoglycemia 8% respectively. Incidence of abortion was 28.5% as compared to 18% in the study of A. Gupta. Premature labour and stillbirth was 42.8% compared to the study of T.V. Arya (66.7%). Incidence of ARF was 6% in present study as compared to study of T.V. Arya (47.6%), A. Gupta (9.0%). S.S. Sabharwal (5%) respectively.

Out of 364 patients of Plasmodium Falciparum positive malaria, all 9 patients who had cerebral symptoms were admitted in hospital. Therefore, in present study, incidence of cerebral symptoms was 2.41% as compared to the study of S.S. Sabharwal (Bokaro) (8.5%).

Incidence in present study was high (2.41%) compared to the study of Hornn and Kerelitz (1.5%) and low as compared to the study of Bomford (0.25%).

Therefore, in present study, incidence of anemia was 36% as compared to the study of Gerald S. Murphy (28%). Hypoglycemia 8% and thrombocytopenia 4% respectively were observed. In present study, incidence of hyperparasitemia was in 20% cases associated with manifestation of severe and complicated malaria. Results of other investigations war: leukocytosis 34%, leukopenia 4%, protein urea 10% respectively. ECG showed kyperkalamic changes in 4% cases.

In present study of 50 cases of Plasmodium Falciparum malaria, incidence of mortality was 14% (7 patients out of 50). They were mainly due to complications of Plasmodium Falciparum malaria, like 2 cases (4%) of cerebral malaria, 2 cases (4%) of ARF, 1 case (2%) of DIC, 1 case (2%) of ARDS and 1 case of Black water fever (2%).

Considering mortality with symptoms of Plasmodium Falciparum malaria, mortality rate was higher in patients who presented with altered level of consciousness. Prognosis wan poor in patients admitted in deep comatose state or those lapsed in deep coma after admission. Pulmonary edema occurred more commonly as a complication in Plasmodium Falciparum malaria and was associated with 100% mortality[10-13].

CONCLUSION

Plasmodium Falciparum malaria is one of the important infectious diseases with significant morbidity and mortality, particularly in developing countries like India. Complication rate in Plasmodium Falciparum malaria was significantly higher. Most complications had occurred in the age group between 21-30 years where in other age groups it was less. Incidence of malaria was significantly higher during the months of October to December. The commonest clinical symptoms in order of frequency were fever, vomiting, bodyache, headache, sweating and altered level of consciousness. Commonest clinical signs were splenomegaly, pallor, clubbing, icterus and hepatomegaly (8%). The commonest complications were cerebral manifestations. All the deaths noted were in complicated malaria group. Mortality rate was

REFERENCES

1. Gupta, A., 1987. A clinical pattern of complicated malaria in North-west India. JAPI, Vol. 35, No. 13.
2. Range, R.C.B., 1987. A typical presentation of Falciparum malaria-4 cases. JAPI, Vol. 35, No. 18.
3. Warrel, D.A., 1989. Cerebral malaria quart. I Med., 71: 369-371.
4. Tung, V. and SC. Arya, 1987. Clinical study of cerebral malaria. JAPI, Vol. 35, No. 4.

5. Stephen, L.H., 1986. Clinics in tropical medicine and communicable disease. Malaria, 1: 171-217.
6. Sabharwel, B.S.S., 1982. Clinical study of malaria in Kiriburu hospital. JAPI, Vol. 30.
7. Murphy, G.S., C. Edward and I.I.I. Oldfield, 1996. "Falciparum malaria." Infec dis clin Nor Am., 4: 747-775.
8. Daroff, R.B., 1967. Cerebral malaria. JAMA: J. Am. Med. Assoc., 202: 679-682.
9. Ray, A.P., 1987. Falciparum containment programme. Delhi, Vol. 0.
10. Mehta, S.R., 1986. Falciparum malaria 210 cases. JAPI, 34: 119-120.
11. Huynh, V.T., A.K. Piet, P.S. Hans, 1998. Hypoglycemia in falciparum malaria: Is fasting an unrecognized and insufficiently emphasized risk factor? JAPI, 46: 921-922.
12. 1998. Indian college of physicians Academic wing of API malaria technical report series II Mishra NP. Bombay ICP JAPI, 1-80.
13. Kochar, D.K., I. Thanvi, B.L. Kumawat and A.N. Shubhakaran, 1998. Importance of blood glucose level at the time of admission in severe and complicated malaria. J Assoc Phy India., 46: 923-925.