

## A Study of Multiorgan Dysfunction in Patients with Plasmodium Falciparum Malaria

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### Abstract

**Background:** Malaria is a global problem, creating a menacing health problem worldwide. Nearly all serious illnesses and deaths from malaria are caused by *P. falciparum* malaria.

**Aims & Objective:** This study aimed to study the multiorgan dysfunction in plasmodium falciparum malaria.

**Methods:** A prospective study was conducted on patients, who were admitted at our Medical College Hospital to the Medicine ward and ICU under Medicine Department. The study was carried out on 108 patients admitted during the period of two years.

**Results:** In present study out of 108 PF malaria cases 67.6% had multiorgan failure and 32.4% had single organ failure. In total cases of plasmodium falciparum cases 66.7% were male and 33.3% were female. Hepatomegaly was found in 34.3%, splenomegaly in 46.3% and 21.3% had hepatosplenomegaly, rest of the patients reported with associated illness.

**Conclusion:** Fever with chills and rigors are the most common presenting symptom noted in all cases. Multiorgan dysfunction is more common than single organ dysfunction.

**Keywords:** *P. falciparum* malaria, Multiorgan Dysfunctions, Fever, Chills, Complications.

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### Introduction

WHO (2000) reported, Severe malaria which is much less common than uncomplicated disease, is difficult to define precisely, especially in region where malaria is endemic, because other serious illnesses can co-exist with malaria infection. Severe malaria is generally defined as acute malaria with major signs of organ dysfunction or high parasitemia [1]. A large number of reports across the country indicating a shift in the clinical presentation of malaria cases from a single complication to multiple complications. Severe falciparum malaria is an important cause of multiple organ failure in Indian intensive care unit (ICU) patients [2].

The net result seems parasite induced local release of pathological mediators like cytokines, nitric oxide and free radicals leading to multiorgan manifestation [3]. Recently there is a changing trend in not only the clinical manifestations but also the complications, and more and more patients presenting with ominous systemic manifestations

[4].

Hence, present study undertaken to evaluate multiorgan dysfunction in patients with plasmodium falciparum malaria.

#### Aim:

The main aim of the study to evaluate the multiorgan dysfunction in plasmodium falciparum malaria.

#### Objectives:

1. To determine the incidence of multiorgan dysfunction in patients with plasmodium falciparum malaria.
2. To analyse the distribution of organ dysfunction of patients with plasmodium falciparum malaria.

#### Material and Methodology:

This prospective study was conducted on patients, who were admitted at our Medical College Hospital

to the Medicine ward and ICU under Medicine Department. The study was carried out on 108 patients admitted during the period of two years. Clearance was obtained from the ethical committee for the study.

Patients satisfying the inclusion and exclusion criteria were enrolled into the study.

#### Inclusion Criteria:

1. All patients of both sexes with age 18 years and above.
2. All documented cases of Plasmodium Falciparum malaria.

#### Exclusion Criteria:

1. All patients with age <18 years
2. HIV Positive individuals
3. Patients with diseases like Chronic Renal Failure, Diabetes Mellitus with microvascular and macrovascular complications, Rheumatic heart disease, Coronary artery disease, Sickle cell anemia.
4. All patients other than Plasmodium Falciparum malaria.

#### Data Collection Methods

The patients were studied by taking detailed history with regards to their presenting complaints and clinical examination was done as mentioned in the

Proforma in annexure. All patients were routinely investigated for Complete Hemogram, Peripheral blood smear for malarial parasite and/or Rapid malarial Antigen test, percentage of parasitemia, Random Blood Sugar; Liver function test: Serum Bilirubin, SGPT, SGOT, Alkaline Phosphatase, Serum Proteins; Renal function test: BUN, Serum Creatinine; Urine Creatinine, Urine Na<sup>+</sup>, GFR, Creatinine Clearance, Coagulation Profile: PT/INR, CT, BT; Electrolytes (Na<sup>+</sup>, K<sup>+</sup>); Urine analysis, Serological test for HBsAg, HCV, HIV, Chest X-ray, USG Abdomen, ABG.

All the patients were evaluated for organ dysfunction as per the WHO (2000) criteria for severe falciparum malaria.

All above mentioned parameters or laboratory test done as per standard methods.

#### Data Analysis:

Data was analyzed by statistical Product and service solution V-16 (SPSS 16) statistical software. Data was presented in frequency and percent distribution form. Association in between the parameters was tested using Pearson's chi square test or Fishers exact test. The significance level was set at p<0.05. P less than 0.05 was considered as significant.

#### Observation and Results:

**Table 1: Incidence of Multiorgan Dysfunction in Patients with Plasmodium Falciparum Malaria**

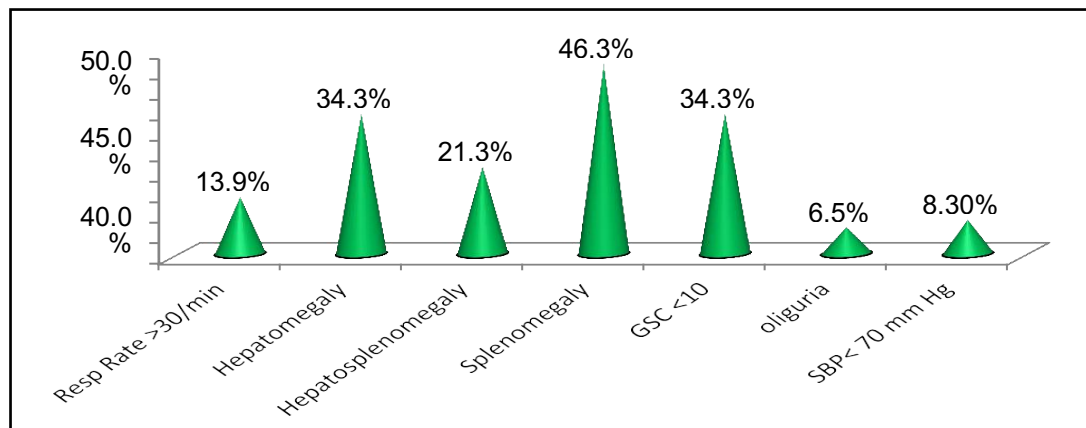
Organ failure	Frequency	Percentage
Single organ	35	32.4
Multi organ	73	67.6
Total	108	100

In present study out of 108 PF malaria cases 67.6% had multiorgan failure and 32.4% had single organ failure (Table 1).

**Table 2: Gender Wise Distribution of Patients with Plasmodium Falciparum Malaria**

Gender	Frequency	Percent
Female	36	33.3
Male	72	66.7
Total	108	100.0

In 108 cases of plasmodium falciparum cases 66.7% were male and 33.3% were female (Table 2).



**Figure 1: Findings Noted In Patients with Plasmodium Falciparum Malaria.**

13.9% Plasmodium Falciparum patients had respiratory rate more than 30 per min. Hepatomegaly was found in 34.3%, splenomegaly in 46.3% and 21.3% had hepatosplenomegaly. Glasgow coma scale was less than 10 in 34.3% cases, 6.5% had oliguria, Systolic blood pressure was less than 70 mm of Hg in 8.3% of cases (Figure 1).

**Table 3: Distribution of Organ Dysfunction of Patients with Plasmodium Falciparum Malaria.**

Organ dysfunction	Frequency	Percent
Cerebral Malaria	37	34.3
Severe Anemia	83	76.9
Circulatory collapse	9	8.3
ARF	12	11.1
ARDS	15	13.9
Jaundice	89	82.4

Cerebral Malaria was developed in 34.3% plasmodium falciparum malaria, 76.9% had severe anemia, while 8.3% had circulatory collapse. 11.1% cases had ARF, 13.9% had ARDS and 82.4% had developed Jaundice (table 3).

**Table 4: Distribution of Patients with Number of Organ Dysfunction with Plasmodium Falciparum Malaria**

Organ dysfunction	No's	Percent
Single	35	32.4
Jaundice & Severe Anemia	38	35.2
Cerebral Malaria , Jaundice and Severe Anemia	20	18.5
Cerebral Malaria , Jaundice ,Severe Anemia and ARDS	7	6.5
Cerebral Malaria , Jaundice, Severe Anemia , ARDS and ARF	2	1.9
Cerebral Malaria , Jaundice, Severe Anemia , ARDS , ARF and Circulatory collapse	6	5.6
Total	108	100.0

Single organ dysfunction was noted in 32.4% PF malaria patients. Jaundice and Severe anemia was developed in 35.2% PF malaria patients.

In 18.5% PF malaria patients, 3 organ dysfunction was noted. They had cerebral malaria, jaundice and severe anemia.

4 organ dysfunction of cerebral malaria, jaundice, severe anemia and ARDS was noted in 6.5% PF malaria patients. 4 organ dysfunction of cerebral malaria, jaundice, severe anemia, ARDS and ARF

was found in 1.9% PF malaria patients. 5.6% PF malaria patients had 6 organ dysfunction of cerebral malaria, jaundice, severe anemia, ARDS, ARF and circulatory collapse (Table 4).

**Discussion:**

The observation made in 108 cases of Plasmodium falciparum malaria for multiorgan dysfunction, admitted in our medical college during a study period of 24 months is discussed and compared with other such studies.

**Incidence of multiorgan dysfunction:**

Study	% of patients
Present study	67.6%
Mohapatra MK et al(5)	53.2%
DK Kochar et al(6)	22.4%

Incidence of multiorgan dysfunction in our study is 67.6% of patients. This is discordance with the studies done by Mohapatra MK et al (2006)[5] and DK Kochar et al (2006)[6] which were 53.2% & 22.4% respectively. This is higher compared to above studies, as our hospital is a tertiary care center, patients of falciparum malaria with multiorgan dysfunction referred to us in large numbers.

#### Sex Incidence

Author	Percentage of male	Percentage of female
Present study	66.7%	33.3%
Preetam N Wasnik et al(7)	75%	25%
Mohapatra M K et al(5)	65.8%	34.2%
Virendra C Patil et al(8)	71.23%	28.77%

In our study, the percentage of males is 66.7% and females is 33.3% which is comparable to males-65.8% & females-34.2% in a study conducted by Mohapatra MK et al (2006)[5] & males-75% & females-25% in a study conducted by Preetam N Wasnik et al (2012)[7] and males-71.23% & females-28.77% in a study conducted by Virendra C Patil et al (2012)[8]. The higher incidence in males was due to the working pattern i.e. males are more exposed to mosquito bites.

#### Organ Dysfunction

Organ dysfunction (OD)	Present study (% of patients)	Virendra C Patil et al(8) (% of patents)	Mohapatra MK,SP Das et al(9) (% of patients)	Mohapatra MK et al(5) (% of patients)
1-OD	32.4%	61.62%	20.8%	46.8%
2-OD	35.2%	19.16%	17.1%	30.4%
3-OD	18.5%	12.32%	18.2%	42.5%
4-OD	06.5%	06.84%	17.1%	24.5%
5-OD	01.9%	-	04.5%	02.5%
6-OD	05.6%	-	06.1%	01.3%

In our study, incidence of one organ dysfunction is 32.4% which is comparable to 20.8% of study done by Mohapatra MK, SP Das et al (2009).[9] Incidence of two organ dysfunction in our study is 35.2% which is comparable to 30.4% of study done by Mohapatra MK et al (2006).[5]

Three organ dysfunction in our study is 18.5% which is comparable to 18.2% & 12.32% of studies done by Mohapatra MK, Das SP et al(2009)[9] and Virendra C Patil et al (2012)[8] respectively. Incidence of four organ dysfunction in our study is 6.5% which is comparable to 6.84% of study done by Virendra C Patil et al (2012) [8]. Incidence of five organ dysfunction in our study is 1.9% which is comparable to 2.5% & 4.5% of studies done by Mohapatra MK et al (2006) [5] and Mohapatra MK, Das SP et al (2009) [9] respectively. Incidence of six organ dysfunction in our study is 5.6% which is comparable to study done by Mohapatra MK, Das SP et al (2009) [9].

#### Conclusion

In our study, out of 108 patients of Plasmodium Falciparum malaria, 73 patients (67.6%) are having multiorgan dysfunction while 35 patients (32.4%) are having single organ dysfunction. In our study, 66.7% patients are males and 33.3% patients are females with Plasmodium Falciparum malaria with organ dysfunction. In our study, Jaundice (serum bilirubin > 3mg/dl) (82.4%) is the most common organ dysfunction in patients with Plasmodium Falciparum malaria.

In our study, Jaundice with Severe Anemia is the most common two organ dysfunction seen in 35.2% patients with Plasmodium Falciparum malaria.

In our study, three organ dysfunction is present in 18.5% patients with Plasmodium Falciparum malaria. Among them Cerebral malaria, Jaundice & Severe anemia are the most common presentation. In our study, four organ dysfunction is seen in 6.5% patients with Plasmodium Falciparum malaria.

Among them Cerebral malaria, Jaundice, Severe Anemia & ARDS are the most common presentation. In our study, five organ dysfunction is seen in 1.9% patients with Plasmodium Falciparum malaria. Among them Cerebral malaria, Jaundice, Severe Anemia, ARDS & ARF are the most common presentation. In our study, six organ dysfunction is seen in 5.9% patients with Plasmodium Falciparum malaria. Among them Cerebral malaria, Jaundice, Severe Anemia, ARDS, ARF & Circulatory collapse are the most common presentation.

#### References

1. World Health Organization, Communicable disease cluster: Severe falciparum malaria. Trans R Soc Trop Med Hyg. 2000; 94(Suppl) 1:S1-90.
2. Sahu S, Mohanty NK, Rath J, Patnaik SB. Spectrum of malaria complications in an

- intensive care unit. Singapore Med J. 2010; 51(3):226-229.
3. SR Mehta, V Joshi, AI Lazar. Unusual acute and chronic complications of malaria. JAPI 1996, VOL. 44, NO.7, Page no.451.
  4. Virendra C Patil, Harsha V Patil. Clinical profile and outcome of complicated plasmodium falciparum malaria. International Journal of Medicine and Public health. 2012; 2:1.
  5. Mohapatra MK. The Natural history of complicated falciparum malaria-A prospective study. JAPI. 2006 November; 54:848-52.
  6. D.K. Kochar, S.K. Kochar, R.P. Agrawal, M. Sabir, K.C. Nayak, T.D. Agrawal, V.P. Purohit & R.P. Gupta. The changing spectrum of severe falciparum malaria: a clinical study from Bikaner (northwest India), J Vect Borne Dis 43, September 2006;104-108.
  7. Preetam N Wasnik, TP Manohar, NR Humaney, HR Salkar. Study of Clinical Profile of Falciparum Malaria in a Tertiary Referral Centre in Central India. JAPI, OCTOBER 2012; VOL.60.
  8. Virendra C Patil, Harsha V Patil. Clinical Profile and Outcome of Complicated plasmodium falciparum malaria. International Journal of Medicine and Public health, 2012;21.
  9. MK Mohapatra, SP Das. The Malaria Severity Score: a Method for Severity Assessment and Risk Prediction of Hospital Mortality for Falciparum Malaria in Adults. FEBRUARY 2009, JAPI, VOL.57.