

# Clinico- Hematological Profile of Renal Disease in Falciparum Malaria: A Study in a Tertiary Care Unit

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## A B S T R A C T

**Introduction:** Malaria is one of the most devastating health problem world wide resulting in severe morbidity and mortality, especially in the tropics and subtropics. Acute renal failure and acute renal injury is seen in association with *P. falciparum* infection. This present study was done to study the extent of renal disease in malaria due to *P. falciparum*.

**Material and methods:** Blood was collected from the median cubital vein and subjected to complete blood picture, Erythrocytic sedimentation rate, haemoglobin estimation, Total count and differential count, Random Blood sugar, Urea, creatinine, electrolyte levels, Bilirubin, SGPT, SGOT, Urine was collected to detect the deposits, albumin levels and urine sugar levels.

**Results:** 59% males and 41% females and the mean age was  $38.32 \pm 5.91$  years. The most common symptoms among the patients was fever, seen in all the patients (100%) followed by splenomegaly in 80% of the patients and chills and rigors in 78% of them, hepatomegaly in 44%. Creatinine was high in 27% of the cases and reduced in 8%. Similarly, 5% had a low bilirubin level, but 59% of them had elevated levels of bilirubin. Hyponatremia was seen in 16 cases and hypernatremia was seen in 5 cases. Most of the patients (79%) had normal levels of sodium. Increased output of protein was seen in 21% and hyperkalemia was seen in 24%.

**Conclusion:** 21% of renal failure was observed in our study with increased bilirubin levels, hyponatremia and hyperkalemia. Therefore, is of imminent urgency to identify the patients with falciparum malaria infection at the earliest so that further morbidity can be reduced with treatment.

**Keywords:** Plasmodium Falciparum, Malaria, Renal Disease, Bilirubin

## INTRODUCTION

Malaria is caused by Plasmodium spp, which is a protozoan belonging to the Sporozoa family. 4 spp of plasmodia can cause malaria in human – *P. falciparum*, *P. vivax*, *P. ovale* and *P. malariae*.<sup>25</sup> Of these, *P. falciparum* is known to cause the most severe infection.<sup>26</sup> This disease is one of the most devastating health problems worldwide resulting in severe morbidity and mortality, especially in the tropics and subtropics.<sup>1</sup> The main causes for its severe nature are due to the manifestations, involvement of multiple organs, and delay in diagnosis which leads to failure of proper treatment.<sup>3</sup> Malaria is endemic in several countries. It is estimated that there are around 270 million new cases of malaria every year with 110 million active cases with 2 million deaths occurring annually.<sup>4</sup> 2.48 million cases are reported from the South Asian countries itself.<sup>27</sup> In India, around 90-95% people live in zones where malaria has been reported earlier or in areas where the climatic conditions favor the parasite transmission<sup>7</sup>, and around 35-40% of the malarial

cases are due to *P. falciparum*.<sup>8</sup> Children, immunodeficient individuals and pregnant women are more vulnerable and may get cerebral manifestation and anemia.<sup>18,12</sup> Among the pregnant women, the most common complications are still birth, premature deliveries, abortions, low birth weight.<sup>6</sup>

Malaria due to *P. falciparum* can affect any organ of the body including brain, heart, kidneys and can result in multiple organ failure<sup>3</sup>

Involvement of the kidneys is observed in the *Pl. falciparum* and *Pl. malariae* infections. Acute renal failure and acute renal injury is seen in association with *P. falciparum* infection, especially in the endemic areas.<sup>9</sup>

Acute renal failure occurs when the serum creatinine levels of the patient increases over 3mg/dL and / or blood urea is over 20mM.<sup>10</sup> The symptoms may vary from mild proteinuria to metabolic acidosis associated with azotemia. Additionally, there may be no specific effects of the fever such as fluid and electrolyte depletion and resulting imbalance.<sup>28</sup>

This present study was done to study the extent of renal

disease in malaria due to *P. falciparum*.

### MATERIAL AND METHODS

This study was undertaken by the Department of General Medicine of Mallareddy medical college for women from July 2018 to Dec 2019. A total of 100 patients of all ages, who had come to the emergency ward or the general medicine and were diagnosed with falciparum malarial fever were included into the study. Patients with fever due to any other reasons including due to *P. vivax* were excluded from the study.

This study was cleared by the Institutional Ethical Committee. The nature of the study was explained to the patient and informed consent was taken. Those patients who were unwilling to consent to the study were excluded.

A thorough medical and clinical examination was done for all the patients after taking the detailed demographic details. Blood was collected from the median cubical vein and subjected to complete blood picture, Erythrocyte sedimentation rate, hemoglobin estimation, Total count and differential count was done. Biochemical tests such as Random Blood sugar, Urea, creatinine, electrolyte levels, Bilirubin, SGPT, SGOT, were also done. Peripheral blood smear was done to check the presence of the parasite. Severity

of the infection was diagnosed by the QBC technique. Urine was collected to detect the deposits, albumin levels and urine sugar levels.

The statistical analysis was done using SPSS software and Microsoft Excel. The results were represented using tables and graphs.

### RESULTS

100 patients were included in our study, out of which there were 59 (59%) males and 41 (41%) females. The range of the age among the patients was 18 – 74 years, the youngest being 18 years and the oldest 74 years, the mean age being  $40.32 \pm 5.91$  (Fig: 1). Most of the patients belonged to the 31 to 40 years age group (32%), followed by 41-50 years of age (22%). 7 (7%) of them were below 20 years of age (Fig: 1).

The most common symptoms among the patients was fever, seen in all the patients (100%) followed by splenomegaly in 80% of the patients and chills and rigors in 78% of them, hepatomegaly in 44%. Anemia was seen in 67% of the cases, while 58% complained of dehydration. 44% experienced vomiting and 27% had jaundice and altered sensorium each (Fig: 2).

There was an increase in the blood sugar in 74 (74%) of the cases and decrease in 3 (3%). Blood urea was higher than normal in 41 cases and 27 were lower than normal but 32 of them had blood urea in normal levels. Creatinine was high in 27% of the cases and reduced in 8%. Similarly, 5% had a low bilirubin level, but 59% of them had elevated levels of bilirubin. Hyponatremia was seen in 16 cases and hypernatremia was seen in 5 cases. Most of the patients (79%) had normal levels of sodium. Increased output of protein was seen in 21% and hyperkalemia was seen on 24% (Table: 1).

Out of the 100 patients with falciparum malaria infection, 21 of them were had acute renal failure, while in the rest of them, there a few biochemical changes and the severity also was reduced (Fig: 3) Out of these 21 cases, 7 died (33.3%) and 14 survived (66.7%).

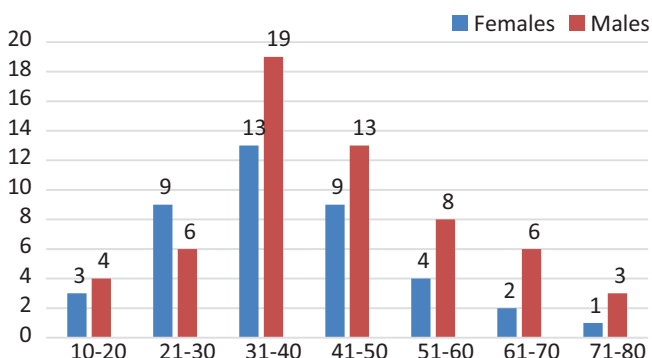


Figure-1: Age and sex distribution of patients

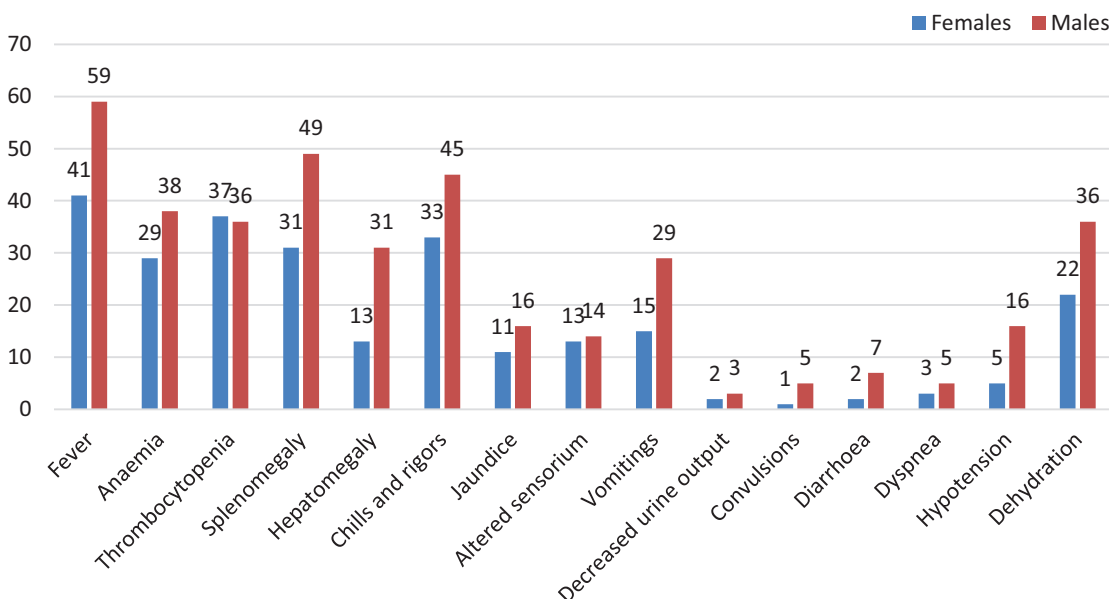
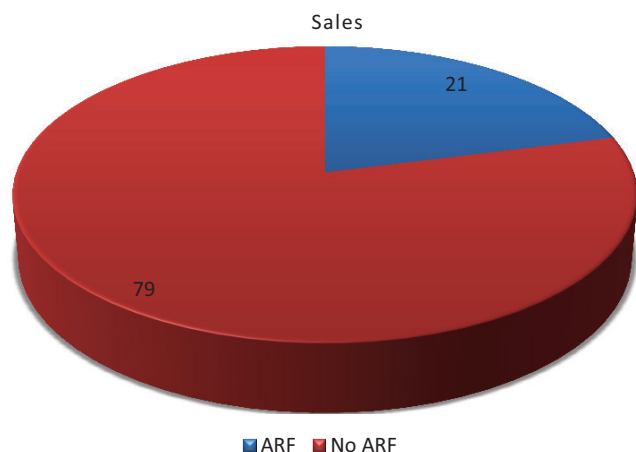


Figure-2: Symptoms in patients

Biochemical parameters	Increase	Decrease	Within normal limits
Blood sugar	74	3	23
Blood urea	41	27	32
Serum Creatinine	27	8	65
Serum bilirubin	59	5	36
Sodium	5	16	79
Potassium	24	19	57
Urine protein	21	-	79

**Table-1:** Biochemical parameters in patients with falciparum malaria infection



**Figure-3:** ARF in patients

## DISCUSSION

Malaria due to Plasmodium falciparum is reemerging as a very important health problem and in quite a few cases it is causing renal disease and renal failure. The involvement of the kidneys is due to the interaction between the RBC abnormalities and that of TH1 and TH2 activation.<sup>12</sup> There is a considerable increase in morbidity and mortality due to P. falciparum in the tropical and subtropical regions. There is a wide difference in the involvement of the kidneys in these patients.<sup>13</sup>

In the present study, we have reported a prevalence of 21% of Acute renal failure among the patients who have malaria due to P falciparum. In a study by Padhi and Mishra, 50.9% of the children in their study had some form of renal involvement or the other.<sup>12</sup> Maheshwari et al reported a prevalence of 46.9%.<sup>13</sup> However Sheehy et al have reported a prevalence of renal involvement in <1% of the cases in their study.<sup>14</sup>

In the present study, 59% of the patients were Males and 41% were females. A male to female ration was observed to be 2:1 in a study by Bag et al<sup>15</sup>, and 1.6:1 in a study by Kondrachine and Trigg.<sup>16</sup> A study by Toshani et al reported 70.78% to be males and 29.23% to be females.<sup>19</sup> The male predominance could be due to the more outdoor activity amongst the males rather than the females. Moreover, females do not tend to seek medical advice often, making the incidence reported to be lesser than it actually is.<sup>12</sup>

The mean age in our study was 38.32 ± 5.91 years. In a study by Nityanand, et al the mean age was 32.7 ± 14 years.<sup>17</sup> Another study by Maheshwari et al reported a mean age to be 35.5 years.<sup>18</sup>

The most common symptom was fever which was seen in

all the 100 patients. The other symptoms observed were splenomegaly in 80% of the patients and chills and rigors in 78%, Anemia was seen in 67%, dehydration in 58%, hepatosplenomegaly in 44%, vomitings in 44% jaundice in 27% and altered sensorium in 27%. Also thrombocytopenia was one of the common symptoms observed in 74% of the patients. In a study by Toshani et al, more than 55% of the patients had anemia and thrombocytopenia was seen in all the cases of falciparum malaria and in more than 90% of the cases in vivax malaria.<sup>19</sup> The high incidence of anemia was attributed to the low dietary foods and fragile health of the population, especially among the patients with rural background.<sup>19</sup> In a study by Nityanand et al, 78.3% of the patients had anemia.<sup>17</sup> Jaundice was observed in 46.6% of the cases in a study by Nityanand et al and 58.85% in a study by Kochar et al.<sup>20</sup>

Blood urea was higher than normal in 41 cases and 27 were lower than normal but 32 of them had blood urea in normal levels. Creatinine was high in 27% of the cases and reduced on 8% of the. Similarly, 5% had a low bilirubin level, but 59% of them had elevated levels of bilirubin. A higher level of bilirubin, ALT and AST levels were seen in another study by Gurjeet Singh et al, corroborating our study.<sup>21</sup> Another study by Elnoman et al also reported similar findings.<sup>22</sup> Salahy et al found all the liver parameters, including bilirubin, AST, AST to be increased in patients with malaria.<sup>23</sup>

Hyponatremia was seen in 16 cases and hypernatremia was seen in 5 cases. Increased output of protein was seen in 21% and hyperkalemia was seen on 24%. In a study by Prakash et al, Hypokalemia was seen in 19.2% of the cases and Protein output in urine was seen in 57% of the patients.<sup>29</sup> Similar results were observed in a study by Rath et al, where 21.4% children had hyperkalemia, 14.3% had hypoglycemia, hyponatremia was seen in 33.9% of the cases.<sup>8</sup> Hyponatremia had been attributed to the severe vomitings and diarrhoea among the patients, where there was an excessive loss of fluids.<sup>24</sup>

## CONCLUSION

21% of renal failure was observed in our study showing that there is an increase in the prevalence of morbidity and mortality in patients with plasmodium falciparum infection. Therefore, it is of imminent urgency to identify the patients with falciparum malaria infection at the earliest so that further morbidity can be reduced with treatment. Thus, the community needs to have proper health education to encourage both males and females to seek medical assistance as soon as possible when they notice the signs and symptoms of malaria.

## DISCUSSION

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In the present study, we have reported a prevalence of 21% of Acute renal failure among the patients who have malaria due to *P. falciparum*. In a study by Padhi and Mishra, 50.9% of the children in their study had some form of renal involvement or the other.<sup>12</sup> Maheshwari et al reported a prevalence of 46.9%.<sup>13</sup> However Sheehy et al have reported a prevalence of renal involvement in <1% of the cases in their study.<sup>14</sup>

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The most common symptom was fever which was seen in all the 100 patients. The other symptoms observed were splenomegaly in 80% of the patients and chills and rigors in 78%, Anemia was seen in 67%, dehydration in 58%, hepatosplenomegaly in 44%, vomitings in 44% jaundice in 27% and altered sensorium in also 27%. Thrombocytopenia also was one of the common symptoms observed in 74% of the patients. In a study by Toshani et al, more than 55% of the patients had anemia and thrombocytopenia was seen in all the cases of *falciparum* malaria and in more than 90% of the cases in vivax malaria.<sup>19</sup> The high incidence of anemia was attributed to the low dietary foods and fragile health of the population, especially among the patients with rural background.<sup>19</sup> In a study by Nityanand et al, 78.3% of the patients had anemia.<sup>17</sup> Jaundice was observed in 46.6% of the cases in a study by Nityanand et al and 58.85% in a study by Kochar et al.<sup>20</sup>

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