CLINICO-MICROBIOLOGICAL ASPECT OF MALARIA IN A TERTIARY CARE HOSPITAL

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ABSTRACT

BACKGROUND
Malaria is a major cause of mortality and morbidity in the tropical and subtropical regions of the world. The incidence of malaria worldwide is estimated to be 300 - 500 million. India accounts for 77 percent of the regional total. The aim of this study is to identify the various species of malarial parasites, their clinical features and its complications.

MATERIALS AND METHODS
A descriptive study was carried out on 100 patients of malaria, admitted in Department of Medicine, Patna Medical College and Hospital, Patna, a tertiary care hospital from January 2010 to August 2011.

RESULT
Out of these 100 patients 68 cases had Plasmodium falciparum infection, 27 had malaria from P. vivax and 5 patients had combined falciparum and vivax infection.

CONCLUSION
It is therefore suggested that early diagnosis of malarial parasites and prompt treatment may help in preventing many of the devastating complications of their disease including renal or multiorgan dysfunction.

KEYWORDS
Malarial Parasites, Clinical Feature, Complication.


BACKGROUND
Malaria is a protozoal disease transmitted by the bite of infected anophelines mosquitoes. It is the most important of the parasitic diseases of humans with transmission in 107 countries containing 3 billion people and causing 1 - 3 million deaths each year. Malaria is a major cause of mortality and morbidity in the tropical and subtropical regions of the world. Developed countries are relatively free of malaria, but it remains well entrenched across the tropical world.1

The incidence of malaria worldwide is estimated to be 300 - 500 million clinical cases each year with about 90 percent of these occurring in Sub-Saharan Africa and mostly caused by P. falciparum. Of reported cases of malaria, India accounts for 77 percent of the regional total. Major endemic areas in India account for 77 percent of the regional total. Major endemic areas in India are in the North-Eastern states, Andhra Pradesh, Chhattisgarh, Gujarat, Jharkhand, Bihar, MP, Maharashtra, Rajasthan and Odisha.2

Five species of the genus Plasmodium cause nearly all malarial infections in humans. These are P. falciparum, P. vivax, P. ovale, P. malariae and -in Southeast Asia -the monkey malaria parasite P. knowlesi, which can be reliably identified only by molecular methods. Almost all deaths are caused by falciparum malaria. Human infection begins when a female anopheline mosquito inoculates plasmodium sporozoites from its salivary gland during a blood meal. Symptoms of malaria include fever, shivering, arthralgia, vomiting, anaemia, haemolysis and jaundice, haemoglobinuria and convulsions. There may be a feeling of tingling in the skin, particularly with malaria caused by P. falciparum.3

The classical symptom of malaria is cyclical in occurrence of sudden coldness followed by rigor and then fever and sweating lasting four to six hours, occurring every two days in P. vivax and P. ovale infections, while every three for P. malariae. P. falciparum can have recurrent fever every 36 - 48 hours or less pronounced and almost continuous fever. Splenomegaly, severe headache, cerebral ischaemia, hepatomegaly, hypoglycaemia and haemoglobinuria with renal failure may occur.4

Chronic malaria is seen in both P. vivax and P. ovale, but not in P. falciparum. Here, the disease can relapse months or years after exposure due to the presence of latent parasites in the liver.5

MATERIALS AND METHODS
A descriptive study was carried out on 100 patients of malaria admitted in Department of Medicine, in a tertiary health care centre in Bihar from January 2010 to August
2011. Cases were selected with complaint of untreated fever of short duration and/or raised body temperature without any pre-existing documented systemic illness with clinical features like fever-paroxysmal, remittent or intermittent, chills, anaemia, splenomegaly, hepatomegaly, headache, vomiting, drowsiness, altered behaviour, confusion, unarousable coma, etc. Confirmation of diagnosis was made by demonstration of plasmodium in the peripheral blood by thin and thick blood film examination by immunochromatographic test, Quantitative Buffy Coat analysis for parasite, complete blood profile including platelet count.

Details of Investigations
A. Examination of peripheral blood film to detect the presence of plasmodium by Leishman’s stain. A thin and thick blood film was made from each patient. It was dried and stained. Slide was covered with stain just enough in amount so as not to overflow the edges of slide. Stain was allowed to act for 1 - 2 minutes. About two volumes of distilled water was added to it and mixed gently. The mixture was allowed to act for 4 to 8 minutes. The stain mixture was washed off with ordinary clean water. Care was taken not to wash off the smear. Any excess stain was wiped out from the underside of the slide and the slide was let to stand on end to dry. An oil emulsion was used on the microscope for identification of the parasite.

B. Quantitative Buffy Coat is a laboratory test to detect infection with malaria or other blood parasites-1. The blood is taken in a QBC capillary tube, which is coated with Acridine Orange [a fluorescent dye] and centrifuged. 2. The fluorescent parasite can then be observed under Ultraviolet light at the interface between RBC and Buffy coat.

C. Optimal Kit Test- Three monoclonal antibodies are used. Two of the monoclonal antibodies are pan specific, recognising all four species of malaria; a third monoclonal antibody is specific only for P. falciparum LDH. The overall sensitivity obtained with the Optimal test for P. falciparum and P. vivax is 94% and 88%, respectively with a specificity of 100% and 99% respectively.

Statistical Analysis
After confirming the diagnosis of malaria by peripheral blood smear examination and/or immunochromatography and/or Buffy coat examination, 100 cases were studied for various parameters as described in materials and methods. The outcome of the study was statistical. The data collection was entered in the Microsoft Excel computer program using SPSS version 16.0 and checked for any discrepancy. The result was presented in proportion/percentages.

Ethical Consideration
Ethical clearance was taken from Institutional Ethical Committee of Patna Medical College and Hospital, Patna. The consent was taken from each patient included in the study.

RESULTS
Out of these 100 patients 68 cases had Plasmodium falciparum infection, 27 had malaria from P. vivax and 5 patients had combined falciparum and vivax infection. Out of 100 cases studied, 77 were male and 23 were female. The age of patient varied from 13 - 75 years. The maximum incidence of the disease was observed among patients in the age group from 21 years to 40 years in both sexes [Table 1].

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>No. of Patient</th>
<th>Percentage [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-20</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>21-30</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>31-40</td>
<td>36</td>
<td>36</td>
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<tr>
<td>41-50</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>51-60</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>61-70</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>More than 70</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1. Age Distribution of Cases Studied [n= 100]

Out of 100 cases 62 were diagnosed by light microscopy in peripheral blood smears, 95 cases were diagnosed by immunochromatography [Optimal IT]. Out of these 100 patients 68 cases had Plasmodium falciparum infection, 27 had malaria from P. vivax and 5 patients had combined falciparum and vivax infection [Table 2, 3].

<table>
<thead>
<tr>
<th>Diagnosis by Peripheral Blood Smear Examination [Light Microscopy]</th>
<th>Diagnosis by Immunochromatography [Optimal]</th>
<th>Diagnosis by Buffy Coat Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>62</td>
<td>62</td>
<td>95</td>
</tr>
</tbody>
</table>

Table 2. Showing Diagnosis of Malaria Infection [n= 100]

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Plasmodium Species</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>P. falciparum</td>
<td>68</td>
</tr>
<tr>
<td>2.</td>
<td>P. vivax</td>
<td>27</td>
</tr>
<tr>
<td>3.</td>
<td>Combined (both falciparum and vivax)</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 3. Number of Cases of Different Types of Plasmodium Infection (n= 100)

Out of 100 cases (100%) who presented with fever, 60 cases were with headache, 60 cases with vomiting, 33 cases with abnormal behaviour, 36 cases with convulsions, 28 cases with unconsciousness, 24 cases with diminished urine output, 18 cases with dark coloured urine, 42 cases with jaundice, 46 cases with pulmonary oedema/ ARDS, 48 cases with hepatomegaly and 86 cases with splenomegaly [Table 4].

L, ral blood smears, 95 were diagnosed by 2%; u q/L) in 22%.

Higher in males disease in age range from 15 - 75 years. Incidence was found among patient in the age group from 21 - 40 years in both sexes. Prakash et al (1996) also reported maximum incidence of the disease in age range from 15 - 85 years. Incidence was found higher in males, probably because they are more exposed to outdoors.

Out of 100 cases 62 were diagnosed by light microscopy and 27 had infection alone. 27 had splenomegaly and 3 with pulmonary oedema. This is in agreement with findings of Kulkarni et al (2000), T. Shabab et al (2003) and Anil K Mohanty et al (2004). In our study, 24 cases presented with diminished urine output and 18 with dark coloured urine. Nityanand et al (1997) reported oliguria in 50% cases.

In the present study, 48 cases presented with hepatomegaly and 86 cases with splenomegaly. Mohanty et al (2004) found hepatomegaly in 72% cases and splenomegaly in 80% cases respectively. Newton et al (2003) found similar results. All the above findings showed that malaria along with renal involvement also had multisystem involvement in various ways and effects on prognosis of the disease.

Laboratory parameters in present study, out of 100 cases 29 cases showed TLC > 12,000/µL and serum potassium was > 135 mEq/L in 41 cases, serum sodium was < 135 mEq/L in 41 cases and serum potassium was > 5 mEq/L in 22 cases and blood sugar level was < 40 gm/dL in 29 cases [Table 5].

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Lab Investigation</th>
<th>No. of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>TLC (&gt; 12000/µL)</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>2.</td>
<td>HB (&lt; 10 gm%)</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>3.</td>
<td>Serum bilirubin (&gt;3 mg/dL)</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>4.</td>
<td>SGPT (&gt; 100 U/L)</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>5.</td>
<td>Serum sodium (&lt; 135 mEq/L)</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>6.</td>
<td>Serum potassium (&gt; 5 mEq/L)</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>7.</td>
<td>Blood sugar (&gt; 40 gm/dL)</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>

Table 5. Laboratory Investigations in Cases of Malaria (n = 100)

DISCUSSION

The present study was carried out in the Department of Medicine in wards, emergency and ICU of a tertiary health care centre in Bihar. After confirming the diagnosis of malaria by peripheral blood smear examination and/or immunochromatography and/or Buffy coat examination, 100 cases were studied for various parameters as described in materials and methods. The outcome of the study was statistically analysed, tabulated and compared.

Out of 100 cases 62 were diagnosed by light microscopy in peripheral blood smears, 95 were diagnosed by immunochromatography (optimal) and 65 were diagnosed by Buffy coat examination. In these 68 cases had P. falciparum infection alone, 27 had P. vivax infection and 5 cases had combined P. falciparum and P. vivax infection [Table 2, 3].

77% of total cases were male and 23% were female. This male predominance is difficult to explain, but is supported from other studies of Mehta et al (2001) and Prakash J et al (2003).

The age of patients varied from 15 - 75 years. The maximum incidence of the disease was observed among patient in the age group from 21 - 40 years in both sexes. Prakash et al (1996) also reported maximum incidence of the disease in age range from 15 - 85 years. Incidence was found higher in males, probably because they are more exposed to outdoors.

Among all cases of malaria (n=100) fever was present in all cases (100%), 60 cases had headache, 60 had vomiting, 36 had convulsion, 33 had abnormal behaviour, 28 cases presented with unconsciousness, 24 cases with decreased urine output, 18 with dark coloured urine, 42 cases with anaemia, 46 cases with jaundice, 48 with hepatomegaly, 86 cases had splenomegaly and 3 with pulmonary oedema. This is in agreement with findings of Kulkarni et al (2000), T. Shabab et al (2003) and Anil K Mohanty et al (2004). In our study, 24 cases presented with diminished urine output and 18 with dark coloured urine. Nityanand et al (1997) reported oliguria in 50% cases.

In the present study, 48 cases presented with hepatomegaly and 86 cases with splenomegaly. Mohanty et al (2004) found hepatomegaly in 72% cases and splenomegaly in 80% cases respectively. Newton et al (2003) found similar results. All the above findings showed that malaria along with renal involvement also had multisystem involvement in various ways and effects on prognosis of the disease.

Laboratory parameters in present study, out of 100 cases 29 cases showed TLC > 12,000/µL. Leucocytosis has been observed in severe malaria even in the absence of detectable bacterial infection. It is associated with poor prognosis (WHO, Trop. Med. Hyg, 2000; Ladhani S et al 2002).

In our study, 52 cases had haemoglobin < 10 gm/dL, of which 22 had severe anaemia. Kocher et al (1997) reported similar observation in their study.

In our study, serum sodium was < 135 mEq/L in 41 cases and serum potassium was > 5 mEq/L in 22 cases. Blood sugar level was less than 40 gm/dL in 29 cases. Krishnan et al (2003) showed similar results.

In our study, 44 cases showed serum bilirubin > 3 mg/dL and 37 showed ALT > 100 U/L. Marsh et al (1995) found similar observation. In our study among extrarenal involvement and its outcome in total patients (n=100) 22% were severely anaemic with Hb% < 5 gm/dL, out of which 4 cases died; 44 showed hepatic involvement with serum bilirubin > 3 mg/dL, out of which 7 died; 28 patients had cerebral malaria, out of which 7 (25%) died; 3% had developed pulmonary oedema/ARDS with 100% mortality; 29% were hypoglycaemic (blood sugar < 40 gm/dL) at the time of admission, out of which 31% died. Hypoponeraemia < 135 mEq/L was present in 41% cases with 21.9% mortality and hyperkalaemia (> 5 mEq/L) in 22%, out of which 5 (22.72%) died. Similar extrarenal involvement was observed by different workers. Prakash J et al (1996), Segasothy M (1994) and Trang TT et al (1992) had similar observation. In our study, renal impairment was detected on the basis of serum creatinine > 1.5 times baseline or rise in serum creatinine > 0.3 mg/dL and/or oliguria (< 0.5 mL/kg for 6 hours). Out of 100 cases, 30 (30%) showed acute kidney injury on the basis of mentioned criteria. This finding corresponded well with the findings of other workers. Rath et al (1990) reported 38.4%, A Sovunmi et al (1996) reported 45%, Sitprija et al (1970) reported 66.6% and Patis et al (2003) reported 51% incidence of renal failure due to falciparum malaria in their study.

CONCLUSION

Overall mortality in this study was 36.6% among the cases of ARF. Oliguria, serum creatinine, dyselectrolytaemia and
multisystem involvement were risk factors for death in the study. The overall prognosis of non-oliguric renal failure was far better than oliguric renal failure. The patients who developed oliguric renal failure had bio-chemical parameters higher than non-oliguric renal failure patients. Patients with milder renal impairment not requiring dialysis had a better prognosis. It seems likely that the patients who fared worse did so because of multisystem dysfunction and more severe renal impairment. It is therefore suggested that early diagnosis of falciparum malaria and prompt treatment may help in preventing many of the devastating complications of their disease including renal or multiorgan dysfunction.

REFERENCES