A Study of Clinical Profile and Outcome in Adults with *Plasmodium vivax* Malaria

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ABSTRACT

BACKGROUND

Among malarial parasites, *Plasmodium vivax* is most prevalent in humans. Recent studies have shown severe and fatal complications with *Plasmodium vivax* infection. We wanted to evaluate the clinical spectrum, complications and outcomes of adult subjects with *Plasmodium vivax* malaria mono-infection.

METHODS

This is a retrospective study involving 100 subjects.

RESULTS

Males were more commonly affected. It was most prevalent in the second decade of life. Fever was present in all patients. The other common symptoms were headache, vomiting, and jaundice. The incidence of associated clinical findings were pallor (43 %), icterus (21%), hepatomegaly (39 %) and splenomegaly (27 %). Severe thrombocytopenia was seen in 18 %, hyper bilirubinaemia in 39 % of subjects. Cerebral malaria was observed in 3 %, acute kidney injury in 13 %, ARDS (Acute Respiratory Distress Syndrome) in 5 % cases, MODS (Multi Organ Dysfunction Syndrome) was seen in 3 % cases, with a mortality of 3 %.

CONCLUSIONS

Complications like ARDS, AKI (Acute Kidney Injury), cerebral malaria and MODS were observed in benign tertian malaria subjects in our study. Cerebral malaria, AKI, MODS, ARDS were associated with high degrees of mortality.

KEYWORDS

Plasmodium vivax, ARDS (Acute Respiratory Distress Syndrome), Cerebral Malaria, AKI (Acute Kidney Injury), MODS (Multiorgan Dysfunction Syndrome)

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BACKGROUND

Malaria is characterized by fever, chills, sweat, anaemia and splenomegaly. Four species of *Plasmodium* cause infection in humans i.e. *Plasmodium falciparum*, *vivax*, *malariae* and *ovale*. Transmission of infection is by the bite of female Anopheles mosquito. Andhra Pradesh is one of the major endemic areas of malaria in India. Among malarial parasites, *Plasmodium vivax* is most prevalent in humans. It causes approximately 100 – 300 million cases per year.[1] *Plasmodium falciparum* malaria is well established cause for complications like cerebral malaria, severe anaemia, renal failure, adult respiratory distress syndrome, hypoglycaemia, shock and hypotension, DIC (Disseminated Intravascular Coagulation) and bleeding, convulsions, acidaemia, jaundice, hyperparasitaemia, hyper bilirubinaemia. Recent studies have shown severe and fatal complications with *Plasmodium vivax* infection. *Plasmodium vivax* causing complications like cerebral malaria, thrombocytopenia, DIC, ARDS, and renal failure.[2,3] was being observed in last 30 years. Kochar et al[3] reported severe manifestations with *Plasmodium vivax* malaria in their study. In order to assess the clinical spectrum and severity of *vivax* malaria, this study is conducted.

We wanted to assess the clinical spectrum of patients with *Plasmodium vivax* malaria mono-infection along with the complications and outcome of *Plasmodium vivax* malaria mono infections.

METHODS

This is a retrospective study involving 100 patients. Those admitted with *Plasmodium vivax* malaria in General Medicine department in King George Hospital at Visakhapatnam, a tertiary care teaching hospital were selected. After selecting the appropriate subjects as per inclusion criteria, relevant data was collected, tabulated and analysed.

Inclusion Criteria

- Inpatients with fever and peripheral smear and / or QBC (Quantitative Buffy Coat) positive for *Plasmodium vivax*.
- Age more than 18 years.

Exclusion Criteria

- Patients diagnosed with *Plasmodium falciparum* or mixed infections.
- Age less than 18 years.
- Patients with a history of pre-existing lung disease, heart disease, renal disease were excluded from the study.

Statistical Analysis

Microsoft excel 2007 and SPSS version 20.0 were utilized for statistical analysis. Results were tabulated, and categorical variables depicted as number and percentages.

RESULTS

A total of 100 patients admitted with fever and peripheral smear and / or QBC positive for *Plasmodium vivax* were selected for the study. Patient with severe malaria were defined as per World Health Organisation guidelines.[4] The following were the findings in tabulated form.

Age	No. of Patients / %	No. of Males / %	No. of Females / %
18 - 20	6	4	2
21 - 30	37	23	14
31 - 40	25	19	6
41 - 50	13	9	4
51 - 60	9	4	5
61 - 70	6	4	2
> 70	4	2	2

Table 1. Age Distribution

Clinical Features	No of Patients / %
Fever	100
Jaundice	36
Vomiting	42
Headache	47
Pain Abdomen	12
Cough	7
Breathlessness	8
Bleeding	5
Altered Sensorium	4
Oliguria	13
Petechiae	3
Seizure	3

Table 2. Symptoms

Sign	No. of Patients / %
Pallor	43
Icterus	21
Pedal Oedema	5
Splenomegaly	27
Hepatomegaly	39
Respiratory Signs	5
CNS Manifestations	3

Table 3. Clinical Signs

The predominant age group affected was that between 21 - 30 years. The next frequent age group affected was 31 - 40. The mean age in this study was 35.17 years. Among the 100 cases studied, 64 % were males and 36 % were females. Ratio of male to female is 1.7 : 1. Fever was present in all the patients (100 %). Jaundice was seen in 36 % cases whilst headache was observed in 47 % cases. In addition, vomiting was observed in 42 % patients, pain abdomen in 12 % patients whilst breathlessness was observed in 8. Cough was observed in 7 %. Pallor was seen in 43 % patients and 21 % patients had icterus. Splenomegaly was present in 27 % patients and 39 % patients had hepatomegaly. Respiratory involvement was seen in 5 %. CNS manifestations were seen in 3 % cases in the form of altered sensorium and seizures.

Profile of Laboratory Findings

Haematological findings: 16 % patients of the study population had haemoglobin less than 6 g / dL, 13 % had normal haemoglobin. Thrombocytopenia of < 1.5 lakh / µL was seen in 76 % patients in our study and severe thrombocytopenia (< 50,000 / µL) was seen in 18 % cases, of which 3 patients presented with petechiae, gum bleeding and epistaxis and required platelet transfusions. Liver abnormalities: S. Bilirubin of more than 3 mg / dL was seen

in 39 % cases. Renal complications: Acute kidney injury was seen in 13 % patients. Table 4 shows the incidence of various features of severe malaria in this study.

DISCUSSION

Among malarial parasites, *Plasmodium vivax* is the most prevalent in humans. Recent studies have shown severe and fatal complications with *Plasmodium vivax* infection. The findings of our study were compared with other similar studies, and discussed here. As per the study done by Echeverri et al,[5] 65 % of the studied individuals were men, which correlated to our study, which had a male preponderance i.e. 64 %. This may be due to the predominant outdoor working pattern of men. In this study, the maximum incidence was seen in the second decade (37 %) followed by third decade (25 %). The results correlated with the studies conducted at Columbia.[5] In our study, fever was the presenting symptom in all the patients. This finding correlates to the results obtained from studies conducted at Chuncheon, Korea, by Song et al.[6] Vomiting and pain abdomen was observed in 42 % and 12 % respectively for the patients in our study. The same correlates to 39 % and 34 % for the patients in the study conducted at Columbia.[5] Cough and breathlessness were seen in 7 % and 8 % of cases of patients in our study respectively. The same correlates with the study conducted at Bikaner[1] in which 10 % of the patients had these symptoms. Neurological complications like seizures and altered sensorium were observed among 3 % and 4 % of the patients in our study respectively. The results varied with the study done at Bikaner[3] where the incidence was 12.5 %. The higher incidence of cerebral malaria in their study was due to the fact that only patients with severe malaria were included; whereas our study included subjects with *vivax* malaria fulfilling the inclusion criteria, irrespective of the severity. Oliguria was seen in 13 % of the subjects during the course of hospital stay. This varied with the study at Bikaner,[3] in which the incidence was 45 % as they had included only severe cases.

Manifestations of Severe Malaria	Present Study (%)	Kochar (%)[2,3]	Naha (%)[10]
Cerebral Malaria	3 %	12.5	1.41
Anaemia (Hb < 5 g / dL)	11 %	32.5	0.47
Leukocytosis (> 12000 / mm^3)	6.5 %	-	-
Thrombocytopaenia (< 50000 / mm^3)	18 %	22.5	31.92
Hyperbilirubinaemia (> 3 mg / dL)	39 %	57.5	13.62
Acute Kidney Injury	13 %	45	0.94
ARDS	5 %	10	1.88
Hypoglycaemia	7 %	2.5	0
DIC	0 %	5	0
MODS	3 %	47.5	-
Mortality	3 %	5	0

Table 4. Manifestations of Severe Malaria

Clinical Signs

Pallor and icterus were present in 43 % and 21 % respectively in our study, while it was seen in 46 % and 15 % respectively in patients during the study done at Columbia.[5] Hepatomegaly and splenomegaly were noted in 39 % and 27 % respectively in our study. The same was 15.8 % and 42 % respectively in the study done at the Republic of Korea.[6]

The study done by Kochar et al[3] is one of the pioneer studies about the complications of mono infections with *Plasmodium vivax* malaria. In this study, 40 patients of severe malaria, as per the WHO criteria, were studied and the complications were noted. The complications noted were manifestations of hepatic dysfunction and jaundice in 57.5 % patients, renal failure in 45 % patients, severe anaemia in 32.5 % patients, cerebral malaria in 12.5 %, acute respiratory distress syndrome in 10 %, shock in 7.5 % and hypoglycaemia in 2.5 %, thrombocytopenia in 12.5 %, and multi-organ dysfunction in 47.5 % patients. Trampuz et al[7] in their study reported that thrombocytopenia was the most common abnormality in blood investigations at 60 %, hyperbilirubinemia was observed among 40 %, anaemia in 30 %, and elevated hepatic aminotransferase values in 25 %. In a study conducted by Andrade et al[8], severe anaemia and hepatic dysfunction was seen among 26.5 % of the cases. Thrombocytopenia was the most common laboratory abnormality found in patients in a study conducted by Oh et al[9] in 85.1 %. Severe thrombocytopenia ie platelet count of < 60,000 / µL was noted in 29.6 %. In spite of severe thrombocytopenia, coagulation profiles were normal. Neurological manifestations in the form of altered sensorium, coma and seizures were reported in 1.41 % cases in a study done by Naha et al.[10] Beg et al[11] reviewed the literature regarding 41 cases of CNS involvement in *Plasmodium vivax* mono infections. The neurological manifestations included altered sensorium, seizures and coma. Neurological complications were observed in 3 % in the present study. Amitabh et al[12] in their study reported 8 cases of acute kidney injury in *Plasmodium vivax* malaria. Renal ischemia is the major pathophysiology resulting in acute tubular necrosis. Renal failure was observed in 13 % subjects in our study and in 10.5 % cases in the study conducted at Buritus, by Andrade et al[8]. ARDS was noted in 5 % subjects in the present study. The incidence of ARDS in a study done by Andrade et al[8] was 21.05 %. Tan L.K. et al[13] in their study reported cases of respiratory complications in *Plasmodium vivax* malaria which ranged from bronchitis, acute lung injury to ARDS.

CONCLUSIONS

This study shows that *Plasmodium vivax* malaria infection can also develop severe and life-threatening complications, which are usually associated with *falciparum* malaria. Highest incidence of *vivax* malaria cases was in the productive age group of 18 - 30 years and was more commonly seen in males. Life threatening complications such as acute respiratory distress syndrome, acute kidney injury, multiorgan dysfunction syndrome, cerebral malaria complicate benign tertian malaria as seen in our study and are associated with higher mortality rates.

Limitations

As the present study is primarily a tertiary hospital-based study, it is difficult to come to a conclusion on the actual incidence and prevalence of severe *Plasmodium vivax* malaria. Hence, large scale multi-center studies should be conducted to better define temporal profile, demographics, and pathophysiology of this infection.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
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REFERENCES

[1] Mohapatra MK, Padhiary KN, Mishra DP, et al. Atypical manifestations of *Plasmodium vivax* malaria. Indian J Malariol 2002;39(1-2):18-25.
[2] Kochar DK, Saxena V, Singh N, et al. *Plasmodium vivax* malaria. Emerg Infect Dis 2005;11(1):132-134.
[3] Kochar DK, Das A, Kochar SK, et al. Severe *Plasmodium vivax* malaria: a report on serial cases from Bikaner in north-western India. Am J Trop Med Hyg 2009;80(2):194-198.
[4] WHO. Treatment guidelines 2010. (www.who.int)
[5] Echeverri M, Tobón A, Alvarez G, et al. Clinical and laboratory findings of *Plasmodium vivax* malaria in Colombia, 2001. Rev Inst Med Trop Sao Paulo 2003;45(1):29-34.
[6] Song HH, Ok SO, Kim SH, et al. Clinical features of *Plasmodium vivax* malaria. Korean J Intern Med 2003;18(4):220-224.
[7] Trampuz A, Jereb M, Muzlovic I, et al. Clinical review: Severe malaria. Crit Care 2003;7(4):315-323.
[8] Andrade BB, Reis-Filho A, Souza-Neto SM, et al. Severe *Plasmodium vivax* malaria exhibits marked inflammatory imbalance. Malar J 2010;9:13.
[9] Oh MD, Shin H, Shin D, et al. Clinical features of *vivax* malaria. Am J Trop Med Hyg 2001;65(2):143-146.
[10] Naha K, Dasari S, Prabhu M. Spectrum of complications associated with *Plasmodium vivax* infection in a tertiary hospital in South-Western India. Asian Pac J Trop Med 2012;5(1):79-82.
[11] Beg MA, Khan R, Baig SM, et al. Cerebral involvement in benign tertian malaria. Am J Trop Med Hyg 2002;67(3):230-232.
[12] Amitabh V, Kishore U, Singhal A, et al. Acute renal failure due to *Plasmodium vivax* malaria – experience from a tertiary care centre. J Indian Acad Clin Med 2010;11:230-234.
[13] Tan LKK, Yacoub S, Scott S, et al. Acute lung injury and other serious complications of *Plasmodium vivax* malaria. Lancet Infect Dis 2008;8(7):449-454.