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**Original Research Article**

# Clinico-epidemiological profile of patients admitted with *Plasmodium vivax* malaria in a tertiary care hospital, Delhi

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## ABSTRACT

**Background:** Malaria is an important public health problem in India. Severe and complicated forms of malaria are usually associated with *Plasmodium falciparum* species. But recently published literature suggests that *Plasmodium vivax* infection also presents as severe malaria. The objective was to study clinical and epidemiological profile of patients with *P. vivax* malaria admitted in Safdarjung hospital.
**Methods:** A record based retrospective study was conducted in Vardhman Mahavir Medical College & Safdarjung Hospital, a tertiary care hospital in Delhi. Data were collected from all case records with ICD 10 codes for Malaria (B50-B54) for the year 2011 obtained from Medical Records Department, Safdarjung Hospital and analyzed using SPSS 21.0.
**Results:** A total of 147 case records which had information about the test results for type of malaria infection were reviewed. Out of 147, 89 (60.5%) had *P. vivax* malaria. Of the 89 patients with *P. vivax* malaria, 47 (53%) were children and 63 (70.7%) were males. A peak in the number of inpatients was seen in September with median duration of hospital stay of 4 days and case fatality rate of 9%. A total of 56 (63%) patients had one or more severe manifestations of malaria as per WHO criteria. The most common severe manifestation was bleeding 27 (30%) followed by impaired consciousness 18 (20%).
**Conclusions:** In more than half of the malaria patients admitted at the tertiary care centre the diagnosis was *P. vivax* malaria. Of them 63% patients had severe malaria as per WHO criteria.

**Keywords:** *Plasmodium vivax*, Severe malaria, Thrombocytopenia

## INTRODUCTION

Malaria is an important public health problem worldwide. As per World Malaria Report 2016, 212 million new cases of malaria were reported worldwide in 2015 out of which 90% were from WHO African Region, followed by the South-East Asia Region (7%) and the Eastern Mediterranean Region (2%) respectively. In 2015, an estimated 429 000 people died due to malaria worldwide. Most of these deaths occurred in the African Region (92%), followed by the South-East Asia Region (6%) and the Eastern Mediterranean Region (2%). Children under five years are particularly susceptible to malaria illness, infection and death. In 2015, malaria killed an estimated 303 000 under-fives globally, including 292 000 in the African Region.[1]

Among South-East Asia region, India contributes maximum burden (90%) followed by Indonesia (9%) and Myanmar (2%).[1] During 2011, the malaria incidence in India was reported to be around 1.31 million cases.[2] About 50% of the malaria cases have been reported to be due to *P. vivax* in India.[2]

*Plasmodium falciparum* (Pf) is the species responsible for severe and complicated malaria but recently published literature suggests that in the last few years, the severity, complications and even hospitalization rates are also increasing in *P. vivax* infection.

Thus, the present study was conducted to study clinico-epidemiological profile of patients with *P. vivax* malaria admitted in Safdarjung Hospital, New Delhi.

## METHODS

The present study was a record based retrospective study conducted at Vardhman Mahavir Medical College & Safdarjung Hospital, a tertiary care hospital in Delhi which caters to population from Delhi as well as adjoining states like Haryana, Uttar Pradesh and Rajasthan. It has a bed strength of 1531 and average annual inpatient admission of 1.5 lakh.

All the indoor case records with a final diagnosis having ICD 10 codes for Malaria (B50-B54) during the period 1st January to 31st December 2011 were obtained from Medical Records Department, Safdarjung Hospital and screened to identify cases of *P. vivax* malaria.

Only case sheets with a positive laboratory report for *P. vivax* were included in the study. All the case sheets with positive *P. falciparum* or mixed infections were excluded.

The indoor case sheets were reviewed to collect data on the following variables: age, gender, and residence, date of admission, time and mode of admission, place of admission, symptoms and signs at presentation, outcome and date of discharge. The results of the following laboratory investigations were considered: haemogram, peripheral blood smear, serology, renal function tests, liver function tests and plasma glucose. The data extracted from the case sheets were entered in preformed proforma.

Definition of severe malaria by the working group of World Health Organisation was used for identifying severe malaria cases among the inpatients.[3] The parameters taken into consideration for identifying severe malaria as per WHO criteria were: Impaired consciousness, severe anaemia (Hb <5 mg/dl in children & <7 g/dl in adults), pulmonary oedema, jaundice (serum Bilirubin >3 mg/dl), acute renal failure (serum creatinine >3 mg/dL), convulsions, hypoglycaemia (Blood glucose <40 mg/dl), acute respiratory distress syndrome, bleeding manifestations, hypotension (systolic blood pressure of <80 mm Hg in adults and <50 mm Hg in children) & metabolic acidosis.

The information related to platelet count was also collected and platelet count of <1 lac/cu mm was considered as thrombocytopenia and <20,000 /cu mm was considered as profound thrombocytopenia. Collected data were entered in MS Excel and analysed using licensed version of SPSS 21.0. Line diagram and box and whiskers plot were drawn to depict the month wise number of inpatients and duration of hospital stay respectively. Fisher's exact test was used to compare the symptoms of patients with and without severe manifestations. Mann Whitney U test was used to compare median duration of hospital stay among inpatients alive at the time of discharge and those who died. A $p<0.05$ was considered to be statistically significant. The ethical clearance was obtained from Institutional Ethics Committee.

## RESULTS

All indoor case records with a final diagnosis having ICD 10 codes for Malaria (B50-B54) for the year 2011 were screened and a total of 147 case records which had information about the test results for type of malaria infection were reviewed. Out of 147, 89 (60.5%) had *P. vivax* malaria, 47 (32%) had *P. falciparum* while 11 (7.5%) had mixed (*P. vivax* and *P. falciparum*) infections. As, in the present study we wanted to study *P. vivax* mono-infection so the results are for the cases positive for *P. vivax* infections only.

**Table 1: Socio-demographic distribution of the inpatients of *P. vivax* malaria (n=89).**

| Variable | Number | % |
|---|---|---|
| Gender | | |
| Male | 63 | 70.7 |
| Female | 26 | 29.3 |
| Age (years) | | |
| ≤12 years | 47 | 52.8 |
| >12 years | 42 | 47.2 |
| Place of residence | | |
| Delhi | 46 | 51.7 |
| Haryana | 19 | 21.4 |
| Uttar Pradesh | 15 | 16.9 |
| Bihar | 05 | 05.6 |
| Rajasthan | 02 | 02.2 |
| Uttarakhand | 01 | 01.1 |
| Jammu & Kashmir | 01 | 01.1 |

A total of 89 (57%) patients of *P. vivax* malaria were admitted during January to December 2011. Maximum numbers of cases (41; 46.1%) were reported in the month of September followed by August (Figure 1). Most of the patients i.e. 68 (96%) were admitted through emergency. Out of 89 cases 63 (71%) were males, 47 (53%) patients were less than 12 years of age and among children ≤12 year boys were more as compared to girls (30, 63.8%). A total of 46 (52%) patients belonged to Delhi while rest were from nearby states (Table 1). Out of 89 patients of *P. vivax* malaria 8 (8.9%) died. Of these 8 patients 5 (62.5%) were male, 7 (87.5%) were more than 12 years of age and all had one or more complications and 5 (62.5%) died within a day of admission. The median

duration of hospital stay among the 89 patients was 4 days (IQR: 3 days- 5 days). The median duration of hospital stay among patients who were alive at discharge was 4 days (IQR: 3 days –6 days) while the median duration of hospital stay among patients who died was 2 days (IQR: 1.25 days- 4.75 days). [Mann Whitney U = 193.5, p=0.057] (Figure 2).

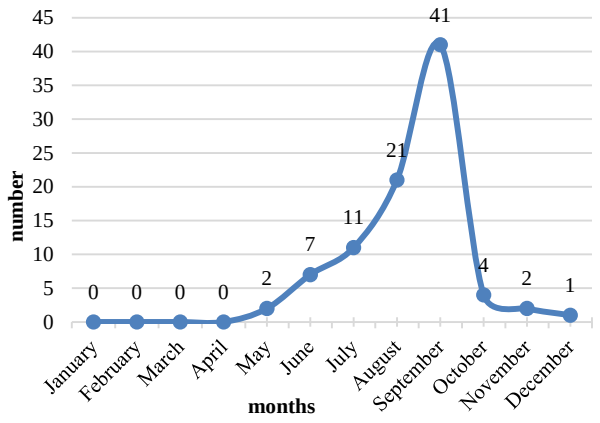


**Figure 1: Seasonal distribution of the inpatients of *P. vivax* malaria (n=89).**

The clinical profile of the admitted cases is shown in Table 2. Overall fever was the most common symptom reported by (87; 97%) patients followed by vomiting (36; 40%), bleeding (27; 30%) and pain in abdomen (24; 27%). Hepatomegaly was present in (53; 62% patients), splenomegaly in (55; 60%) and oedema in (11; 12%) patients. A total 33 patients did not fulfil any criteria for severe malaria but needed indoor management. There was no significant difference between patients with and without severe manifestations with regard to other symptoms (Table 2). A total of six patients had typhoid coinfection.

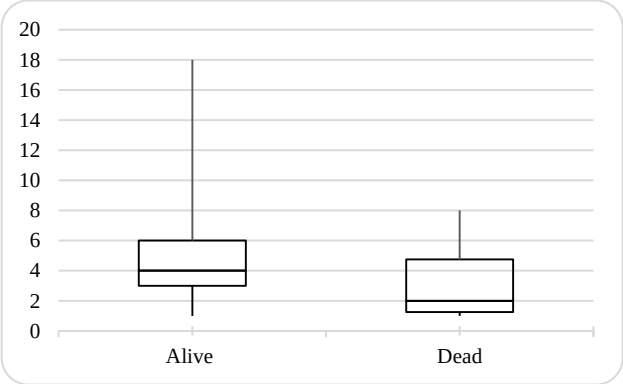


**Figure 2: Duration of hospital stay (days) among inpatients of *P. vivax* malaria (n=89).**

A total of (56; 63%) patients had one or more severe manifestations of malaria as per WHO criteria (Table 3). The most common severe manifestation was bleeding (27; 30%) followed by impaired consciousness (18; 20%). Severe anaemia was present in (15; 17.4%) patients. S. Bilirubin >3 mg was found in 8 (14%) patients. Thrombocytopenia was present in 69 cases (81%) while profound thrombocytopenia (platelet count <20,000) was found in 18 (21%) of vivax cases (Table 4). Even among these 32 patients without severe manifestations, 26 (81.2%) had thrombocytopenia of which seven (21.2%) had profound thrombocytopenia.

**Table 2: Symptoms and signs at the time of presentation amongst the inpatients of *P. vivax* malaria (n=89).**

| | With severe manifestations (n=56) | Without severe manifestations (n=33) | Total (n=89) | P value |
|---|---|---|---|---|
| **Symptoms** | | | | |
| Fever | 55 (98.2) | 32 (96.9) | 87 (98.0) | 1.0 |
| Vomiting | 24 (42.8) | 12 (36.3) | 36 (40.4) | 0.66 |
| Pain abdomen | 16 (28.5) | 08 (24.2) | 24 (27.0) | 9.81 |
| Swelling body/limbs | 11 (19.6) | 07(21.2) | 18 (20.2) | 1.0 |
| Headache | 12 ( 21.4) | 08 ( 24.2) | 16 (18.0) | 0.79 |
| Swelling face | 07 (12.5) | 06 (18.1) | 13 (14.6) | 0.54 |
| Cough | 08 (14.2) | 03 (09.0) | 11 (12.3) | 0.74 |
| Decreased oral intake | 06 (10.7) | 02 (06.0) | 08 (09.0) | 0.71 |
| Loose stools | 06 (10.7) | 02 (06.0) | 08 (09.0) | 0.71 |
| **Signs** | | | | |
| Splenomegaly | 36 (64.2) | 19 (57.5) | 55 (61.7) | 0.65 |
| Hepatomegaly | 35 (62.5) | 18 (54.5) | 53 (59.5) | 0.51 |
| Oedema | 07 (12.5) | 04 (12.1) | 11 (12.3) | 1.0 |

**Table 3: Distribution of inpatients of *P. vivax* malaria according to severe manifestations of malaria.**

| Severe manifestations | n | % |
|---|---|---|
| **Bleeding manifestations (n=89)** | 27 | 30.3 |
| **Impaired consciousness (n=89)** | 19 | 20.2 |
| **Severe anaemia (n=86) *** | 15 | 17.4 |
| **Jaundice (n=59)*** | 08 | 13.5 |
| **Convulsions (n=89)** | 09 | 10.1 |
| **ARF (n=49)*** | 03 | 06.1 |
| **ARDS (n=89)** | 02 | 02.2 |
| **Hypotension (n=89)** | 02 | 02.2 |
| **Hypoglycemia (n=89)** | 01 | 01.1 |
| **Metabolic acidosis (n=89)** | 01 | 01.1 |

***** Lab results were not mentioned in rest of the case sheets

**Table 4: Distribution of inpatients of *P. vivax* malaria according to platelet count (n=85).**

| Platelet count | With severe manifestations (n*=53) | Without severe manifestations (n*=32) | Total (n*=85) |
|---|---|---|---|
| **<20000/ul** | 11 (20.8) | 07 (22.0) | 18 (21.2) |
| **20000- 100000/ul** | 32 (60.4) | 19 (59.3) | 51 (60) |
| **>100000/ul** | 10 (18.9) | 06 (18.7) | 16 (18.8) |

*****Lab results were not mentioned in rest of the case sheets.

## DISCUSSION

Severe forms of malaria requiring hospitalisation are associated with high morbidity and mortality. In the present study more than half of the 157 laboratory confirmed cases of malaria admitted during 2011 in Vardhman Mahavir Medical College & Safdarjung Hospital, a tertiary care hospital in Delhi were suffering from *P. vivax* malaria which is traditionally not thought to cause severe symptoms.The case fatality rate was 8.9%. Other studies from India and outside have reported case fatality rate to vary from 1%-4%.[4-9] The case fatality rate was higher in our study as compared to other studies. Most of the patients (62.5%) died within 1-2 day of admission and bleeding & impaired consciousness was present in 62.5 % of the patients. This indicates that these patients were admitted in a late and critical condition with poor prognosis.

In the present study there were more number of male patients (63;70.7%) as compared to the females, even among children ≤12 years males were more as compared to females (30, 63.8%). Similar results have been reported by various studies conducted across India.[4-7] Maximum number of cases (41; 46.1%) were reported in the month of September followed by August. Verma et al and Sharma and Khanduri have also reported similar findings in their study.[4,5] The reason for more number of cases in August and September can be that the mosquito density increases in monsoon and post monsoon months due to increase in breeding sites.

Of all the admitted cases, 48% belonged to neighbouring states as VMMC & Safdarjung Hospital caters to not only Delhi but other nearby states too.

Median duration of stay in the hospital was 4 days in our study which is comparable to 3.6 days (mean) reported by Zubairi ABS.[6] Almost all patients had fever 87 (98.0%) while vomiting 36 (40.4%), bleeding 27 (30.3%), pain abdomen 24 (27.0%), headache 16 (18.0%) were some of the other common symptoms in our study. Similar findings have been reported by various other studies.[4-7]

In our study, 57 (64%) patients had one or more severe manifestations of malaria as per WHO criteria. Studies conducted among adults across India have reported to vary from 18% to 45.38% while among children the rate varies from 13.7% to 63.1%.[7-11] In the present study severe anaemia was present in 15 (17.4%) patients which is almost similar to that of 13% reported by Suruvu et al in their study.[7] Studies that included only children have reported severe anaemia ranging from 23%-46.6% while among adults it ranged from 5% to 34%.[4,6,8,9,11-13] In our study bilirubin >3 mg/dl was present in 13.5% patients while Limaye et al found it to be present in 8 (5.32%).[9] Hepatic dysfunction was present in 26.2% (17/65) children having *P. vivax* infections as reported by Kochar et al in their study.[11]

Thrombocytopenia is not considered as criteria for severe malaria but several studies conducted in India and outside India have reported thrombocytopenia to be present in patients having severe vivax malaria[10-15]. In our study thrombocytopenia was found to be present in 81% of the

patients which is similar to that reported by Saravu et al (88%) in their study.[7] Tanwar et al in their study reported that 73.1% patients had severe thrombocytopenia.[13]

profound thrombocytopenia (platelet count <20,000) was found in 21% of vivax cases which is almost similar to that reported by another study done in Pakistan where it was 18%.[6] Majority of the patients without severe manifestations also had thrombocytopenia.

We have included data of patients with a laboratory confirmation of *P. vivax* malaria in our study. Hence we could not review case records which did not have information about the test results for type of malaria infection which might lead to underestimation of *P. vivax* malaria. Results for laboratory investigations needed to categorize patients into severe malaria were also not available for all patients included in the study.

## CONCLUSION

Of the 147 admitted malaria cases, 60.5% had plasmodium vivax infection and of them 64% patients had severe malaria as per WHO criteria. Severe manifestations include bleeding, impaired consciousness and severe anaemia. Thrombocytopenia was a common feature among the patients admitted with *P. vivax* malaria. High mortality among the patients with severe plasmodium vivax infection indicates the need for making health professionals aware about severe manifestations in vivax malaria. It is also needed that they are able to identify severe cases at early stage and make a timely referral to higher centres.

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*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

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