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Original Research Article

A Retrospective Assessment of Clinical Profile of P. Falciparum, P. Vivax and Mixed Infections of Malaria

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Abstract

Aim: The objective of this study was to compare the clinical profile of P. falciparum, P. vivax and mixed infections of malaria.

Methods: This retrospective observational study included malaria patients who were admitted to Department of General Medicine, Jannayak Karpoori Thakur Medical College and Hospital Madhepura,, Bihar, India for 12 months. Inpatient retrieved and scrutinized on the basis of the patient's demographic profile, clinical findings, investigations, treatment, and complications during this 12- month period.

Results: The subjects consisted of 60 P. vivax and 40 P. falciparum cases. The P. vivax cases consisted of 45 males and 15 females while P. falciparum cases consisted of 18 males and 22 females. Fever was the most common presentation in all 100 patients both falciparum and vivax infected patients. This was followed by chills and rigors were present in 80 patients, 45 of patients with falciparum and 35 of the patients infected with vivax. Nausea and vomiting were another common complaint was observed in 70 of total patients, more in falciparum 40 than vivax 30. Other less common symptom were, easy fatiguability observed in 30 patients and cough was present in 20 patients. All these manifestations were most commonly observed in falciparum than vivax. Altered sensorium was observed only in falciparum 12 patients. Patients who had mixed infection presented with almost all symptoms like fever with chills and rigors, easy fatigability, vomiting, cough and altered sensorium. Bivariate relationship between clinical features and complications of P. vivax and P. falciparum malaria showed no statistical significant difference.

Conclusion: We concluded that P. vivax Mono infection tends to have as similar course and complications as compared to malaria due to P. falciparum mono infection.

Keywords: P. falciparum, P. vivax, mixed infections of malaria

Introduction

Malaria is a major global infectious disease caused by parasitic protozoans of the genus Plasmodium. Infections in humans primarily involve five Plasmodium species: Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malaria, and Plasmodium knowlesi. [1] In the 20th century, malaria was a dreaded disease. With the efforts of public health agencies and availability of artemisinin derivatives, morbidity and mortality associated with malaria have decreased and there is revival of hopes that malaria will be eradicated from our country in the coming decades. Despite recent reductions in the overall malaria case incidence, malaria remains an important cause of morbidity and mortality. Global estimates suggest that the disease accounts for 300–500 million morbidity cases and contributes to approximately 3 million deaths annually. [2]

Malaria due to P. falciparum has been associated with severe complications and mortality. The World Health Organization (WHO) estimated the global incidence of P. vivax to be 7.5 million cases in 2017, and it is the most prevalent malaria species in Southeast Asia. [2,3] P. vivax is particularly troublesome in urban settings because of increased constructional and developmental activities; there is a rising population of migrant workers in cities of India. Previously labeled as benign, severe manifestations are being reported increasingly in vivax malaria across the globe. [4,5]

India is co-endemic for Plasmodium falciparum and Plasmodium vivax, posing challenges for malaria

control and elimination planning because the two parasite species may differ in mosquito vectors, spatial distributions and transmission dynamics and because of the relapsing nature of P. vivax infection with a dormant liver stage. [6-8] Overall, approximately 66% of malaria infections in India are caused by P. falciparum and 34% are caused by P. vivax. [9] However, the proportional distribution varies across India and a wide range of clinical presentations are seen from both predominant species of malaria. [6] In contrast to Africa, malaria transmission in India is more limited, both adolescents and adults are at risk of severe malaria, and a substantial proportion of cases are infected with P. vivax rather than the traditionally more virulent P. falciparum.

The objective of this study was to compare the clinical profile of P. falciparum, P. vivax and mixed infections of malaria.

Materials and Methods

This retrospective observational study included malaria patients who were admitted to Department of General Medicine, Jannayak Karpoori Thakur Medical College and Hospital Madhepura,, Bihar, Indiafor 12 months. Inpatient retrieved and scrutinized on the basis of the patient's demographic profile, clinical findings, investigations, treatment, and complications during this 12- month period. A total of 100 subjects were included.

Inclusion Criteria:

All slide positive and rapid diagnostic tests (RDT) that confirmed cases of malaria (P. vivax and P. falciparum) admitted and treated were included.

Exclusion Criteria:

These criteria included

(1) patients presented with fever (smear negative for P. vivax and P. falciparum malaria) but treated empirically for malaria
(2) mixed infection of PF and PV malaria
(3) patients presented with clinical features mimicking malaria like dengue fever, sepsis, meningitis were excluded from this study. We also excluded the newborn babies and those patients who died during resuscitation within the first hour in an emergency department before hospital admission formalities were complete.

Methodology

The diagnosis and confirmation of species of P. falciparum and P. vivax malaria were established by thick and thin film of peripheral blood smear examination under oil immersion with giemsa stain and RDT.[10] The RDTs were based on detection of specific Plasmodium spp. lactate dehydrogenase (OptiMal test, Diamed AG, Cressier sur Morat, Switzerland) and histidine-rich protein 2 (Falcivax test; Zephyr Biomedical Systems, Goa, India). Severe complicated malaria was categorized as per World Health Organization guidelines. Severe complicated malaria in the form of cerebral malaria, severe anemia (Hb < 5 mg/dL), thrombocytopenia (platelet count < 1 lac/cumm), pancytopenia, jaundice (>3 mg/dL), acute renal failure (serum creatinine >3 mg/dL), gastrointestinal tract dysfunction, acute respiratory distress syndrome, and multiorgan dysfunction was included in this study. The level of consciousness was assessed using the modified Glasgow modified Glasgow Coma Scale in patients age <9 months and Glasgow Coma Scale in patients age >9 months. Routine laboratory investigations included a complete blood cell count, peripheral smear examination, blood indices, and platelet count and these were sent immediately after admission of all the patients. Urine examination, liver and renal function tests, coagulation profile, cerebrospinal fluid study, chest radiograph, and blood culture were done whenever it was indicated. The case definition of complicated and severe malaria was taken from the WHO guidelines for treatment of malaria 2010.[11] Anemia in this study was defined when Hb of patient was ≤9 gm% while raised alanine aminotransaminase (ALT) was defined when ALT elevated >3x upper limit of normal.

Statistical Analysis. Statistical analyses were performed by social package for statistical science (SPSS) version 16. The data of the two groups were compared using the Fisher or chi- square test appropriate for each study parameter. Confidence interval and odds ratio of two groups were also reported.

Results

Table 1: Baseline characteristics of patients

Baseline characteristics	P. vivax (n = 60)	P. falciparum (n = 40)	All patients (n = 100)
Gender (male/female)	45/15	18/22	63/37
Duration of fever (days, mean SD)	6.4 (4.02)	5.5 (2.8)	5.6 (3.7)
Length of hospital stay (days, mean SD)	4.6 (2.48)	5.0 (3.2)	4.6 (2.8)
Hemoglobin (gm%, mean SD)	11.45 (8.32)	11.80 (9.31)	11.72 (9.41)

A total of 100 subjects were included in the study. It consisted of 60 P. vivax and 40 P. falciparum cases. The P. vivax cases consisted of 45 males and 15 females while P. falciparum cases consisted of 18 males and 22 females.

Table 2: Clinical symptoms

Symptom	P. Falciparum	P. Vivax	Total
Fever	60	40	100
Chills and rigors	45	35	80
Easy fatigability	25	15	40
Nausea, vomiting	40	30	70
Cough	12	8	20
Altered sensorium	12	0	12

Fever was the most common presentation in all 100 patients both falciparum and vivax infected patients. This was followed by chills and rigors were present in 80 patients, 45 of patients with falciparum and 35 of the patients infected with vivax. Nausea and vomiting were the another common complaint was observed in 70 of total patients, more in falciparum 40 than vivax 30. Other less common symptom were, easy fatigability observed in 30 patients and cough was present in 20 patients. All these manifestations were most commonly observed in falciparum than vivax. Altered sensorium was observed only in falciparum 12 patients. Patients who had mixed infection presented with almost all symptoms like fever with chills and rigors, easy fatigability, vomiting, cough and altered sensorium.

Table 3: Comparison of various parameters between P. vivax and P. falciparum malaria at initial presentation

Parameters	P. vivax n	P. falciparum n	P value
Anemia	18	16	0.24
Splenomegaly	26	20	0.36
Thrombocytopenia	21	14	0.29
Raised ALT	6	2	0.95
Jaundice	4	3	0.68
Renal failure	2	1	0.45
ARDS	3	1	0.49
Cerebral malaria	1	1	0.36

Bivariate relationship between clinical features and complications of P. vivax and P. falciparum malaria showed no statistical significant difference.

Discussion

According to the UNICEF, at every 30 seconds, one child expires due to malaria. [12] It is one of the serious problems in our country due to inability to control disease in endemic areas, migration of the populations, and serious complication caused by the disease itself. P. falciparum malaria causes more severe disease, mortality and morbidity so intensive measures have been implemented mainly against it. P. vivax malaria has been neglected and mistakenly considered as “Benign”. [13] But there are few evidences in the past decade from studies in the countries of Asia that P. vivax is able to cause severe disease. [14-16] This may be due to its several important biological differences accounting for these observations, which are the development of the dormant stage in the liver (hypnozoites) causing relapse and greater transmission potential of P. vivax at low parasite densities. P. vivax is the most common geographically widespread species of Plasmodium causing malaria in human beings.

A total of 100 subjects were included in the study. It consisted of 60 P. vivax and 40 P. falciparum cases. The P. vivax cases consisted of 45 males and 15 females while P. falciparum cases consisted of 18 males and 22 females. In studies like Yadav RK et al [17] and Surve KM et al [18] had similar rates of male: female ratio which was 1.32:1. Fever was the most common presentation in all 100 patients both falciparum and vivax infected patients. This was followed by chills and rigors were present in 80 patients, 45 of patients with falciparum and 35 of the patients infected with vivax. Nausea and vomiting were the another common complaint was observed in 70 of total patients, more in falciparum 40 than vivax 30. Other less common symptom were, easy fatigability observed in 30 patients and cough was present in 20 patients. All these manifestations were most commonly observed in falciparum than vivax. Altered sensorium was observed only in falciparum 12 patients. Patients who had mixed infection presented with almost all symptoms like fever with chills and rigors, easy fatigability, vomiting, cough and altered sensorium. A similar observation like fever as presenting complaint and presence of fever in 100% of patients is present in Khuraiya P et al, study, Patel G et al, study and Anshika Jain et al, study group. [19-21] In Rathod SN et al, study fever was present in 95.1% of patients. [22] In Another study group Surve KM et al, fever was present in 99% of the patients. [18] But in all study groups, the predominant complaint is fever only. Along with

fever, chills and rigors is also a common symptom observed in the majority of studies.

Bivariate relationship between clinical features and complications of P. vivax and P. falciparum malaria showed no statistical significant difference. Construction sites in India are commonly suggested as potential transmission hot-spots, especially of severe P. falciparum, in low prevalence, relatively prosperous areas such as Goa. [23,24] Though construction workers, who live and work at these sites and traditionally hail from the east and northeast states of India, accounted for roughly half of the malaria-positive study participants at GMC, they were nearly equally likely to be infected with P. vivax as P. falciparum. These findings may have implications for the conventional understanding of risk factors as well as the basis of targeted control measures at and around construction sites in the low transmission state of Goa. In the future, investigation to determine the possible effect of pre-existing P. falciparum and P. vivax immunity, compared across age, gender, origin and occupation, on transmission in Goa will be carried out.

Conclusion

We concluded that P. vivax mono infection tends to have as similar course and complications as compared to malaria due to P. falciparum mono infection.

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