

Original Research Article

Clinical profile of falciparum, vivax and mixed infections of malaria, from a tertiary care hospital, Coastal Andhra, India

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Received: 15 February 2020

Accepted: 02 March 2020

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ABSTRACT

Background: Malaria is a major health problem in many parts of India and some parts of Andhra Pradesh is one of the endemic areas for malaria. The objective was to study clinical profile and outcome of malaria in both species and mixed infection.

Methods: Present study was carried out on 100 patients admitted during the period of November 2016 - October 2018 in Narayana medical college and hospital, Nellore. Malaria confirmed by Peripheral thick and thin smear or Antigen Assay underwent detailed clinical history and physical examination. This was followed by monitoring the outcome of the patients with respect to morbidity and mortality.

Results: Out Of the 100 patients 58 patients were from rural background, males were predominant, most common age group was 20-30 (34%) followed by 31-40 (31%). Out of 100 patients, 54 patients were falciparum, 44 patients had vivax and two had mixed infection. All of the patients had fever followed by chills and rigors (75%), nausea and vomiting (59%), easy fatigability (28%), pain abdomen (17), cough (14%) in both infections, altered sensorium was seen in only falciparum (20.3%). On clinical examination, 70% of the patients had pallor, splenomegaly in 46%, icterus (23%), hepatomegaly (14%) and pedal edema in 12 patients were observed. All Of the patients were treated with appropriate antimalarial drugs for appropriate duration, and all were recovered without any mortality.

Conclusions: Malaria is very common disease in our country especially in South India, which is one of the endemic areas. Severe malaria usually caused by the falciparum more than vivax, early diagnosis and treatment decreases the mortality and morbidity.

Keywords: Clinical profile, Coastal Andhra, Falciparum, Mixed, Vivax

INTRODUCTION

Malaria is a protozoan disease caused by infection with parasites of the genus plasmodium and transmitted to man by certain species of infected female anopheline mosquito.¹ Six species of the genus plasmodium cause nearly all malarial infections in humans. These are *P. falciparum*, *P. vivax*, two morphologically identical sympatric species of *P. ovale* (as suggested by recent evidence), *P. malariae*, and in Southeast Asia the Malaria monkey malaria parasite *P. knowlesi*.²

World health organisation released latest world malaria report which was released on 19 November 2018 an estimated 219 million cases and 435000 deaths in 2017. Data from 2015-2017 shows that no significant progress in reducing global malaria cases was made in this period.³ Between year 2000 and 2015, malaria incidence among population at risk decreased by 37% globally; during the same period malaria mortality rates among population at risk decreased by 60%. In 2016, there were estimated 216 million malaria cases, an increase of about 5 million cases over 2015. Deaths reached 445000, similar number 2015.⁴

Malaria continues to be major public health threat in India particularly due to *Plasmodium falciparum* which is prone to complications. In India about 21.98% population lives in malaria high transmission areas. About 91% of malaria cases and 99% of deaths due to malaria is reported from north eastern states Chhattisgarh, Jharkhand, Gujarat, Rajasthan, West Bengal and Karnataka and their states also vulnerable with local and focal out breaks of malaria and much of these areas are remote and inaccessible.⁵ The malaria Incidence and deaths due to malaria have reduced significantly in recent years during the period 2000 to 2015, cases declined by 44% from 2.03 million to 1.13 million and deaths declined by 69% from 932 to 287 annually. Falciparum percentage remained around 50% from 2000 to 2013 but rose to 65.6% in 2014 and 67.1% in 2015 in India.⁶ In 2017 total cases reported are 0.84 million and falciparum contributes to 63.39% with total deaths about 109. The present study was carried in South India, as the reports were very few regarding clinical profile of both falciparum, vivax and mixed infections and their final outcome.

METHODS

The present study was done in Narayana medical college and hospital, Nellore. The study was carried out on 100 patients admitted during the period of November 2016 - October 2018 in this hospital. It was a prospective cohort study.

A detailed history was taken followed by a detailed clinical examination to assess clinical severity and all the patients in this study were proved to be case of malaria either by Peripheral smear examination (both thick and thin smear) or MPQBC or by Malarial antigen Assay. These investigations were ordered before the antimalarial treatment was started. Patients below the age 18 years, pregnant, Fever of any other cause were excluded from this study.

Once the patient was diagnosed to have malaria they were started on Anti-Malarial drugs according to the new WHO guidelines for treatment of Malaria. Other supportive treatment was given according to the patients conditions.

RESULTS

In the present study, out of 100 patients more number of males (63 patients) were affected when compared to females (37 patients). Male to female ratio was 1.7:1 (Figure 1).

The predominant age group affected was 20-30 years, which constitutes to about 34%, followed by 31-40 years (31%). Up to 65% of patients affected were in the age group of 20-40, who were young and working outdoors. The mean age of in this study was 38.52 years (Figure 2).

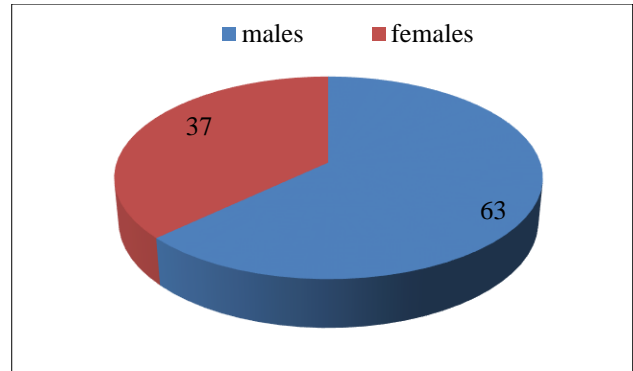


Figure 1: Gender distribution.

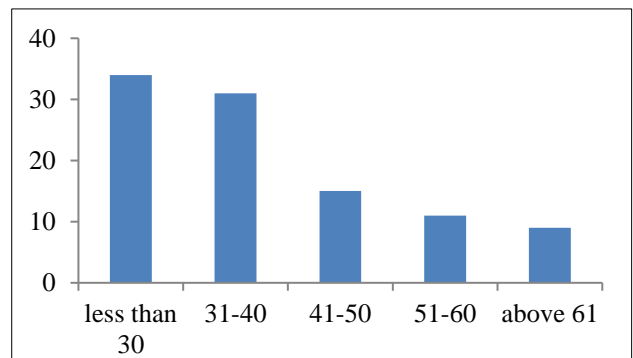


Figure 2: Age distribution.

Majority of these patients were from rural areas i.e. ,58 patients (58%) and 42 patients (42%) from the urban people. Male to Female ratio in rural areas was about 1.6:1 and in urban areas ratio was 1.7:1, almost equal to rural areas (Table 1).

Table 1: Urban and rural distribution.

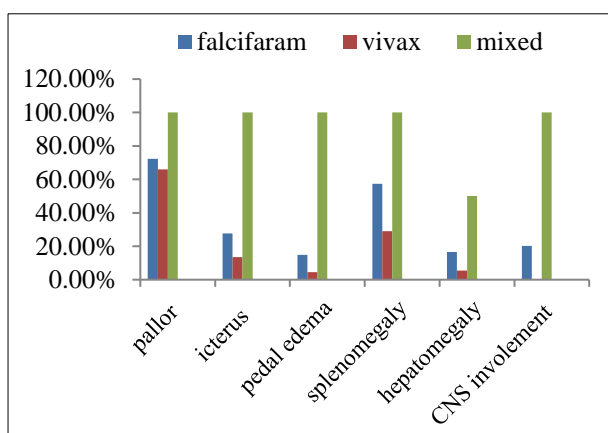
Area	Male	Female	Total
Urban	26	16	42
Rural	37	21	58

Fever is the most common presentation in all 100 patients both falciparum and vivax infected patients. This is followed by chills and rigors was present in 75% (75) patients, 81.4% (44) of patients with falciparum and 70.4% (31) of the patients infected with vivax. Nausea and vomiting were the another common complaint was observed in 59% (59) of total patients, more in falciparum 64.8% (35) than vivax 54.5% (24) .Other less common symptom were, easy fatigability observed in 28% patients, abdominal pain was in 17% patients and cough was present in 14% patients. All these manifestations were most commonly observed in falciparum than vivax (Table 2). Altered sensorium was observed only in falciparum (11%) 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 2: Clinical symptoms.

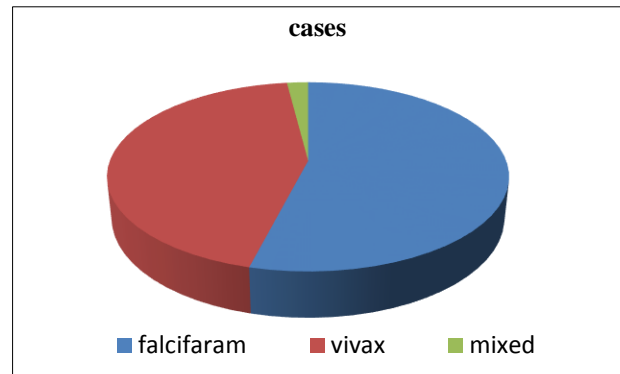
Symptom	<i>P. Falciparum</i>	<i>P. Vivax</i>	Total
Fever	100	100	100
Chills and rigors	44(81%)	31(70%)	75
Easy fatigability	19(35%)	9(20.4%)	28
Nausea, vomiting	35(64.8%)	24(54.5%)	59
Cough	9 (16.6%)	5(11.3%)	14
Altered sensorium	11(20.3%)	0	11

Pallor was the most common clinical sign, was observed in 72.2% (39) patients of falciparum and 65.9% (29) with vivax species. Splenomegaly was second common clinical sign, found in 46% (46) of all patients. It was observed in 57.4% (31) with falciparum and 29% (13) of patients infected with vivax. These were followed by icterus, detected in 23% (23) of patients, more in falciparum 27.7% (15) and 13.6% (6) with vivax species. Hepatomegaly was in 14 patients, out of which 16.6% (9) of falciparum, 5.5% (3) of vivax patients. Among 100 patients pedal edema was observed in 12% (12) patients, again it was more observed in 14.8% (8) of patients with falciparum species and 4.5% (2) of patients with vivax species. Pedal edema was mostly observed in patients with severe anemia. Nervous system involvement was taken into account if the patient had either drowsiness or stupor or coma or seizures. It was observed in 20.3% (11) of patients infected with falciparum species and 100% (2) of patients infected with mixed infections, not observed in any patient infected with vivax species. Two patients with mixed infection were had pallor, icterus, pedal edema, splenomegaly and one of them had hepatomegaly (Figure 3).

**Figure 3: Clinical signs in different species.**

Out of 100 cases of malaria, most commonly observed species were falciparum seen in more than half of patients which contributes to about 54% i.e. 54 cases and vivax contributes to 44% i.e. 44 cases and mixed infection with falciparum and vivax was observed in 2%

i.e. 2 patients (Figure 4). None of the patients of either group falciparum, vivax or mixed infection died in our study. All patients recovered and discharged in good health condition.

**Figure 4: Incidence of different species of malaria.**

DISCUSSION

In this study male to female ratio is 1.70:1. The incidence of malaria more in men than in women due to the working pattern, i.e. men were exposed to mosquito bites outdoors whereas females are less exposed. In other studies also incidence in male sex was observed to be more like our study but the rate of incidence was different in different studies. In studies like Yadav RK et al, and Surve KM et al, had similar rates of male: female ratio which is 1.32:1 in both.^{7,8} In other studies like Khuraiya P et al, and Patel G et al.^{9,10} also some near similar rates above studies which are 1.26: 1 and 1.30:1 respectively. Some studies showed very high incidence in males compared to females like Kalavati GP et al, showed a very high male incidence which is more than three times that of the female which is 3.38:1.¹¹ Vaidya MS et al, study showed more than the double ratio of incidence of malaria in males compared to females.¹²

In present study most commonly affected age group is 21-40, which contributes to 65% of total patients. Among this 21-40, most common age group affected is 21-30 which contains about 34%. Similar observation was found in Khuraiya P et al, and Kalavati GP et al.^{9,11} Statistically 20-40 is the most common age group affected in Khuraiya P et al, study, 52% of affected patients are in 20-40 age group In Khuraiya P et al, and also among this 21-40 most common age group is 21-30 which contains 36% which almost similar to this study.⁹ In Kalavati GP et al, study also most common group is 21-40 which contributes to 54.2% among this 21-40, most common age group is 21-30 which consists of 31.4%.¹¹ Similar observation was found in Vaidya MS et al, study group, i.e. 20-40 is the most common age group affected which Involves 54% of total patients.¹² According to the study done Yadav RK et al, most common age group affected is 18-35 which includes 49% of total patients and second most common age group affected is 35-50 which includes 30% of total patient.⁷

The percentage of patients affected aged above 60 is 9%. Near similar values are observed in Khuraiya P et al, study group and Kalavati GP et al, study group which includes 6% and 5.7% respectively.^{9,11} The predominant age group affected is working age group which is because, this age group is commonly exposed to mosquito bites mainly in fields and outdoors and also our the study follows the age pyramid in our country which shows young people form the base and older people form the apex which contains a lesser percentage of the population.

Fever is the main presenting complaint in our study, present in all 100% of patients. 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.^{9,10,13} In Rathod SN et al, study fever was present in 95.1% of patients.¹⁴ In Another study group Surve KM et al, fever was present in 99% of the patients.⁸ 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.

In this study chills and rigors is present in 75% of patients. Similar was observed in Anshika Jain et al, study group with 75.3% of patients had chills and rigors.¹³ In Other studies incidence of chills and rigors was high when compared to this study. In Khuraiya P et al, study chills and rigors was present in 90.3% of patients, In Kalavati GP et al, study chills and rigors was observed in 84.8%, in Rathod SN et al, study group it was Observed in 83.1% of patients.^{9,11,14} But in Surve KM et al, study group it was observed in only 64% of patients which showing lower incidence of chills and rigors when compared to this study.⁸ It was also noted that 27% of the patients had easy fatiguability as their presenting complaint. There was no mention regarding this in any other studies.

After fever with chills and rigors next most major complaint observed in most of the patients was nausea and vomiting, in this study it is observed in 59% of total patients. Similar observation was observed in Rathod SN et al, and Khuraiya P et al, study groups with almost near percentage of incidence of vomiting i.e. 52.4% and 52.88% respectively.^{14,11} In other study groups like Surve KM et al, Patel G et al, Kalavati GP et al, and Anshika Jain et al, incidence of vomiting is lower compared to this study. In Anshika Jain et al, study group it was 31.84%, Kalavati GP et al group it was 37.1% and in Patel GI group it was 33%.^{10,11,13} The Least incidence of vomiting observed in Surve KM study group, which was observed only in 25% of patients.⁸ The percentage of vomiting was high in our study as the number of patients with malaria had been treated with oral drugs outside which might have lead to gastritis.

Cough and breathlessness was observed in 9% of total cases when compared to this study incidence of cough

and breathlessness was very low in Kalavati GP et al, study which is 2.8 %.¹¹ In Anshika Jain et al, study also it was low when compared to this study i.e. 8.2%.¹³ The higher incidence of these symptoms may be due to higher number of falciparum cases in this study compared to other areas where vivax malaria was predominant. It also signifies that the number of complicated malaria cases were more in our area than in other studies. The other factor which could have lead to higher number of cases of complicated malaria is that ours was a referral center to many rural hospitals around. But in other study groups symptoms of cough and breathlessness was higher when compared to our study. It was 17% in Patel G et al, and symptoms of cough and breathlessness was highest in Rathod SN et al, study which is 24%, the cause may be because of similar reason explained for this study i.e higher incidence of falciparum infection in their study.^{10,14}

The number of patients with pain abdomen in this study was 17%. All other studies have higher incidence of pain abdomen compared to the study except Kalavati GP et al, study, which had very lower incidence compared to this study i.e. 5.7 %.¹¹ The other three studies had almost similar incidence of pain abdomen symptom which is higher compared to present study. In Rathod SN et al, group it was 27.05 %, in Patel G et al, group it was 26.4% and in Anshika Jain et al, group it was 29.1%.^{10,13,14}

Altered sensorium was observed in 11% of total patients. All 11% of patients are falciparum group. In other studies incidence of altered sensorium was almost similar to this study even lower in two studies. It was 13.4% in Khuraiya Pet al, and 10.3% in Patel G et al, study both are comparatively higher when compared to our study, it was lower in Kalavati GP et al, study group 5.7% and least in Surve KM et al study only 4%.⁸⁻¹¹

Pallor was present in 75% of the patients in a study carried out by Malhotra et al, it was noted in 70% in this study.¹⁵ The incidence of pallor was more in patients with falciparum and mixed infection; it was 72.2% and 100% respectively. Pallor was present in only 65.9% of the patients with vivax malaria in this study. In other studies Khuraiya et al, it was 63.4% which was some nearer to our study.⁹ Incidence of pallor was very less in Surve KM et al, and Anshika Jain et al, compared to this study; it was 55% and 50% respectively.^{8,13} In Surve KM study there was more incidence of vivax malaria than falciparum malaria.⁸

Icterus observed in 23% of total patients, in other studies like Khuraiya P et al, and Malhotra et al, it was near similar to this study i.e. 27.8% and 25% respectively.^{11,15} All these three studies including this study had little higher incidence of falciparum cases compared to vivax cases. Icterus is very low in Surve KM et al, which was observed only in 11%.⁸ In Anshika Jain et al, study icterus was observed in nearly half of the patients i.e.

41.79%.¹³ Another observation is in Anshika Jain et al, study incidence of anemia and jaundice was almost of similar percentage.¹³

In present study pedal edema observed in only 12% of patients. It was only 5% in Surve KM Study, very low compared to this study.⁸ Pedal edema was 32.08% in Anshika Jain et al study, very high compared to this study.¹³

Splenomegaly was found in 36% of patients, similar rates observation was made in all other studies except Anshika Jain study, but in Surve KM et al, study which had 32% of splenomegaly patients, Khuraiya P et al, study which had 32.6% of splenomegaly patients and Malhotra et al, group which had 31.25% of splenomegaly.^{13,8,9,15} But in Anshika Jain et al, study group it was observed in more than half of patients 69.92% which is greater than double compared to our study.¹³ Other studies which had very high percentage of splenomegaly are Murthy et al, where patients with splenomegaly are 50%, another study Nand et al, showed 60% of patients with splenomegaly.^{16,17} Splenomegaly in Rathod SN et al, study was 93.45% which is very high compared to this study, which higher rate of falciparum and mixed infections with a low incidence of vivax malaria.¹⁴

Hepatomegaly observed in this study is 14%, seen in the least number of patents compared to other studies. In other studies it was high like Surve KM et al, study showed 20% of patients with hepatomegaly.⁸ In Khuraiya P et al it was 26.9%.⁹ Anshika Jain et al, study showed 56.71% of hepatomegaly incidence in their study, which had higher falciparum infection group in their study.¹³ Another study Rathod SN et al, study had highest rate 65.6% of hepatomegaly in their study.¹⁴

CNS involvement in the form of, Seizures Coma or altered sensorium was observed among 13% of the patients in this study. It was noted that only patients with falciparum infection or mixed infection had these symptoms. It was not observed with any of the patients with vivax malaria. The study by Malhotra et al also found similar observation where the involvement of CNS was observed in 12.5% of the patients.¹⁵ This confirms that cerebral malaria can be caused only by falciparum. None of the patients with cerebral malaria had any residual neurological sequelae. Newton C.R et al, in their study noted that approximately 3% of the patients with cerebral malaria had a neurological deficit.¹⁸ In other studies like Surve KM et al, and Anshika Jain et al, had only 4% and 1.49% respectively.^{8,13}

In the present study is the incidence of falciparum malaria is higher which is 54%, and the incidence of vivax malaria and mixed infections are 44% and 2% respectively. In the study by Alberto Tobin et al, the prevalence of falciparum is 62.6% and whereas vivax was just 35.2% and mixed infection was 2.1%.¹⁹ In another study by Milind Y Nadkar et al, incidence of vivax malaria was 68.53% and falciparum malaria was

31.47%, and 0% incidence of mixed infections was observed.²⁰ In another study by Arevalo et al incidence of vivax and falciparum malaria was almost equal, 50.7% by falciparum and 48.9% by vivax malaria and only 0.4% by mixed species.²¹ From these observations we can conclude that the incidence of particular species varies with geographical area.

CONCLUSION

Malaria is very common disease in our country especially in South India, which is one of the endemic areas. Severe malaria usually caused by the falciparum more than vivax, early diagnosis and treatment decreases the mortality and morbidity.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Gangaram U, Sarikonda GR, Soren B, Venkatakrishnan. Clinical profile of falciparum, vivax and mixed infections of malaria, from a tertiary care hospital, Coastal Andhra, India. *Int J Adv Med* 2020;7:541-6.