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Original Research Article

Clinical profile, laboratory profile of malaria cases attending a tertiary care hospital in South India: two-year study

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ABSTRACT

Background: Malaria a protozoal disease caused by *Plasmodium* species. As per WHO global report 2015, it is distributed in 100 countries throughout the world. The worldwide prevalence of malaria is around 200-300 million cases with an estimated economical loss of 0.5-1 billion per annum. India contributes to 70% of cases and 69% of deaths in south east Asian region. Malaria in India is caused mainly by two species *P. vivax* (Pv) and *P. falciparum* (Pf). The present study was done to evaluate the clinical profile of malarial cases with associated complications and hematological profile in these cases. This study will provide insight into the common species distribution and their clinical presentations with hematological profile.
Methods: The present study was conducted at Narayana general hospital and medical college for two years from March 2014 to February 2016. Study was conducted on 400 confirmed cases of malaria with 200 males and 200 females. Clinical presentations with signs and symptoms were noted and laboratory parameters of cases were noted.
Results: 127 cases of vivax, 243 cases of falciparum and 30 cases of mixed infections were identified. 41-50 years (33.3%) age group was predominantly affected. Fever was the most common symptom (100%) followed by chills (83%). Pallor was the most common sign (76%) followed by splenomegaly (71%). Cerebral malaria was seen in 42 cases, severe anemia in 82, ARDS in 4 and circulatory collapse in 1 case was identified. ESR, PT, BT and APTT were raised in both falciparum and vivax malaria. Severe thrombocytopenia was identified in 100 cases with petechia and minor bleeding manifestations.
Conclusions: To conclude falciparum malaria was more common than vivax malaria in our study with more cases of severe anemia, splenomegaly, cerebral malaria, and severe thrombocytopenia. BT, PT, APTT were raised more in cases of falciparum than vivax malaria. In cases of mixed infections of vivax and falciparum, clinical profile and laboratory indices were more presenting as falciparum than vivax malaria.

Keywords: Anemia, Cerebral malaria, Falciparum malaria, Splenomegaly, Vivax malaria

INTRODUCTION

Malaria a protozoal disease caused by Plasmodium species (*P. vivax*, *P. falciparum*, *P. ovale* and *P. malariae*) is one among the major global health problems. The bite of infected female anopheles' mosquito mainly transmits the disease. The disease is distributed through the tropics and sub tropics from 40° south to 60° north, and occurs mainly at altitudes below 1500 meters.[1] Globally the impact of the disease is variable and affects mainly African countries and south east Asian countries. As per WHO global report 2015, it is distributed in 100 countries throughout the world. The worldwide prevalence of malaria is around 200-300 million cases with an estimated economical loss of 0.5-1 billion per annum. India contributes to 70% of cases and 69% of deaths in south east Asian region. In 2015, 1.13 million cases of malaria were reported with 287 deaths. in

the last 10 years, total malaria cases declined by 42%, from 1.92 million in 2004 to 1.1 million in 2014, combined with a 40.8% decline in malaria related deaths from 949 to 562.[2] Malaria in India is caused mainly by two species *P. vivax* (Pv) and *P. falciparum* (Pf) and transmitted mainly by Anopheles culicifacies. *P. vivax* is more prevalent in plains and *P. falciparum* predominates in forested and peripheral areas. From 1999 to 2013, malaria cases were caused in almost equal proportions by *P. falciparum* and *P. vivax*. An upsurge in cases of *P. falciparum* was observed from 53% in 2013 to 66% in 2014 with a decline in cases of *P. vivax*. This upsurge could be explained by increased outbreaks in falciparum predominant areas and rise in surveillance, use of bivalent rapid diagnostic tests in identification of malarial cases.[3]

Malaria has variety of presentations both typical and atypical. The complications caused are also variable depending upon the species distribution. Hence the present study was done to evaluate the clinical profile of malarial cases with associated complications and hematological profile in these cases. This study will provide insight into the common species distribution and their clinical presentations with hematological profile

METHODS

Study area

The present study was conducted at Narayana Medical college and General hospital for a period of two years from March 2014 to February 2016. Being a tertiary care hospital, case input is primarily from this region and surrounding areas of the district.

Study design

A hospital based prospective cross sectional study was done in 400 confirmed cases of malaria with 200 males and 200 females. All the participants attending the General Medicine department, were informed of the study design and informed consent was obtained. The demographic data (age, sex, etc.) of the cases was recorded on a separate questionnaire sheet and a through history taking and clinical examination was done and signs and symptoms were noted and entered in excel data sheet. The institutional ethical committee approved the study.

- Laboratory investigations were performed on all the confirmed cases:
- Hb estimation, RBC counts, Total and differential counts, Platelet counts by Auto analyzer (BD coulter, USA)
- ESR by Westergen tube method.
- Bleeding time (BT), prothrombin time (PT) and activated prothrombin time (APTT) were noted by standard tests.
- Liver function tests (SGOT & SGPT) by automated biochemical analyzer.

Inclusion criteria

- All cases above 18 years of age.
- Confirmed cases by peripheral smear or QBC (Quantitative Buffy coat) or rapid diagnostic test (RDT). [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)]

Exclusion criteria

- Associated conditions with Dengue or Leptospirosis.
- Comorbid conditions like chronic liver diseases and neurological disorders.
- Patients already empirically treated for malaria.
- Patients with abnormal coagulation profile, associated coagulation disorders, Hemolytic conditions.
- Pregnant women.

Cases of severe complicated malaria were categorized based on WHO guidelines. In cases of cerebral malaria, the level of consciousness was assessed using Glasgow coma scale. Severe anemia (<6mg/dl), severe thrombocytopenia (<50,000platelets/µl), acute respiratory distress (ARDS) and any signs of circulatory collapse were noted and considered under severe malaria. All the cases of malaria and complicated severe cases were managed as per WHO standard guidelines.

RESULTS

In the present study, a total of 22,646 cases of fever attended the General medicine department for a period of two years. 400 confirmed cases of malaria were included in the study with an equal distribution of male and female (200 cases each). The most common age group in both male and female was 41-50 years (male: 35% and female: 31.5%) and mean age of male cases was 42.06±11.51 years and female was 41.46±11.95 years. In present study, no male cases were recorded between 16-20 years. All the other age groups were almost equally distributed between males and females (Table 1). In the study, 127 cases (31.75%) were of vivax malaria (male: 68 and female: 59), 243 (60.75%) cases of falciparum malaria (male: 119, female: 124) and 30 cases (7.5%) accounted for mixed infections (male:13, female:17) (Pv and Pf) (Figures 1 and 2).

Fever was the most common presenting symptom in both (100%) followed by chills in 83% of cases. Fatigue was complained in 67% of males and 69% of females. Bleeding manifestations were seen in 28.5% of females and 19.5% of males. Altered sensorium and seizures was

seen in 35.5%,19% of females and 18%, 11% of males in the study. Cough and Vomiting was observed in 34%, 35.5% of females and 38%, 18% of males in present study.

Table 1: Age wise distribution of malaria cases.

	Male		Female	
Age	**No.**	**%**	**No.**	**%**
16-20 years	0	0	5	2.5
21 -30 years	32	16	28	14
31-40 years	51	25.5	54	27
41-50 years	70	35	63	31.5
51-60 years	35	17.5	38	19
>60 years	12	6	12	6
Total	**200**		**200**	

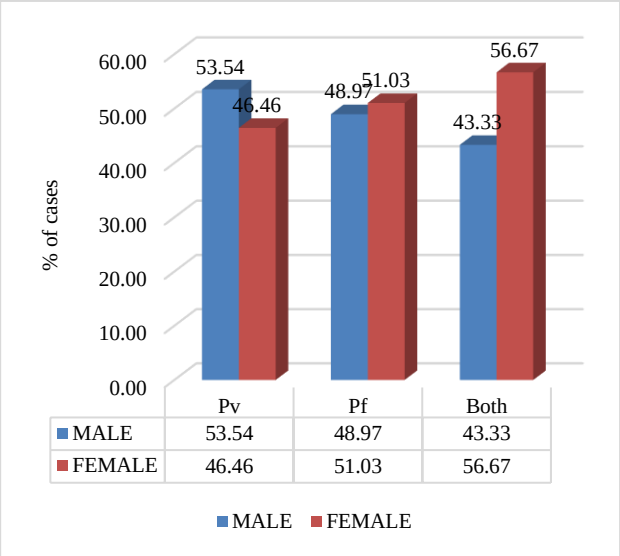

Figure 1: Sex wise distribution of vivax and falciparum.

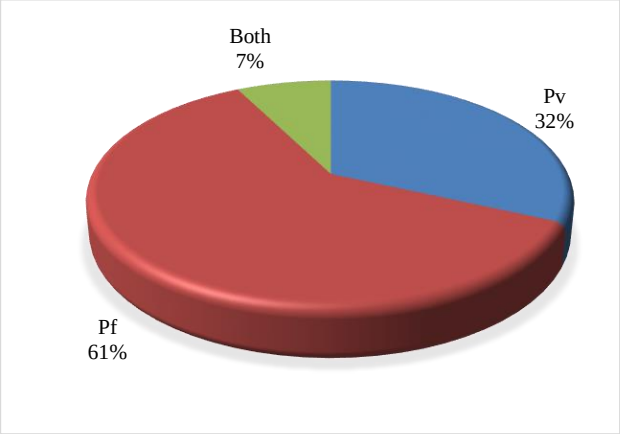

Figure 2: Species distribution of malaria cases.

Pallor was the predominant sign in males (80.5%) as well as females (71%) but most commonly seen in males than females in present study. Splenomegaly was seen in 74.5% of males and 67.5% of females, Hepatomegaly in 65% of males and 17% of females which is a very different finding. This can be explained by the reason that most of the males are alcoholic and this may be the reason for more cases of hepatomegaly in males than females. Icterus was seen in 19% of males and 17.5% of females, petechia in 36.5% of males and 28.5% of females. Meningeal irritation was seen in 18% of males and 11.5% of females in present study (Table 2).

Table 2: Signs and symptoms of cases in malaria.

	Male		Female	
Symptoms	**No.**	**%**	**No.**	**%**
Fever	200	100	200	100
Chills	166	83	166	83
Fatigue	134	67	138	69
Cough	52	26	68	34
Vomit	76	38	71	35.5
Altered sensorium	36	18	71	35.5
Bleeding manifestations	39	19.5	57	28.5
Seizures	23	11.5	38	19
Signs				
Pallor	161	80.5	142	71
Icterus	38	19	33	17.5
Spleenomegaly	149	74.5	135	67.5
Hepatomegaly	130	65	34	17
Petechiae	73	36.5	57	28.5
Meningeal irritation	36	18	23	11.5

As per WHO criteria, cerebral malaria was noted in 18 males and 24 females, severe anemia (<6mg/dl) in 31 males and 51 females. This can be explained by the fact that anemia is more commonly observed in females than males. 4 cases of ARDS and 1 cases of circulatory collapse was seen in females only, no cases were recorded among males.

Hematological profile

Severe anemia (<6mg/dl) was observed in 82 cases (20.5%) in toto, with 32 (39.02%) cases of vivax malaria, 36 (43.90%) cases of falciparum malaria and 14 (17.07%) cases of mixed infections. 218 cases (54.5%) were moderately anemic (6-10mg/dl) with 71 cases (32.57%) of vivax malaria, 134 (61.47%) of falciparum malaria and 5.96 cases in mixed infections.100 cases (25%) were normal (>10mg/dl). 25% of cases had normocytic normochromic picture on peripheral smear study, microcytic hypochromic anemia in 59% of cases and dimorphic anemia in 16% of cases.

In cases of vivax malaria, ESR was heavily raised in 61 cases (51.26%), moderately raised in 53 cases (28.49%) and normal in 13 cases, whereas in falciparum malaria, ESR heavily raised in 40cases (33.61%), moderately raised in 123 cases (66.13%) and normal in 80 cases. In mixed infections, ESR was heavily raised in 18 cases

(15.13%), moderately raised in 10 cases (5.38%) and normal in 2 cases. Severe thrombocytopenia (<50,000/mm) was observed in 25 cases (25%) of vivax, 64 cases (64%) of falciparum and 11 cases (11%) of mixed infections. Moderate thrombocytopenia (>50000-1,50,000/mm^3) was seen in 57 cases (41.01%) of vivax, 72 cases (51.08%) of falciparum and 10 cases (7.19%) of mixed infections. SGOT and SGPT were raised in 40 cases of vivax, 31 cases of falciparum and 11 cases of mixed infections.

Bleeding time (BT) was prolonged in 89 cases (70.08%) of vivax,148 cases (60.91%) of falciparum malaria and 17 cases (56.67%) in mixed cases. Prolonged prothrombin time (PT) was noticed in 49 cases (38.58%) of vivax, 94 cases (38.68%) of falciparum and 7 cases (23.33%) in mixed infections. Activated partial thromboplastin time (APTT) was prolonged in 25 cases (19.69%) of vivax,52 cases (21.40%) of falciparum and 5 cases (16.67%) of mixed infections (Table 3).

Table 3: Laboratory parameters in vivax and falciparum malaria.

	Male			Female		
Laboratory Indices	**Pv (No.) (%)**	**Pf (No.) (%)**	**Both (No.) (%)**	**Pv (No.) (%)**	**Pf (No.) (%)**	**Both (No.) (%)**
Hb%						
Severe anaemia (<6mg/dl)	14 (20.59)	13 (10.92)	4 (30.77)	18 (30.51)	23 (18.55)	10 (58.82)
Moderate anaemia (6-10 mg/dl)	45 (66.18)	85 (71.43)	8 (61.54)	26 (44.07)	49 (39.52)	5 (29.42)
Normal (>10mg/dl)	9 (13.24)	21 (17.65)	1 (7.69)	15 (25.42)	52 (41.94)	2 (11.76)
ESR						
Heavily raised	14 (20.59)	13 (10.92)	4 (30.77)	47 (79.66)	27 (21.77)	14 (82.35)
Moderately raised	45 (66.18)	85 (71.43)	8 (61.54)	8 (13.56)	38 (30.65)	2 (11.76)
Normal	9 (13.24)	21 (17.65)	1 (7.69)	4 (6.78)	59 (47.58)	1 (5.88)
SGOT and SGOT						
Normal	48 (70.59)	101 (84.87)	4 (30.77)	39 (66.10)	111 (89.52)	9 (52.94)
Raised	20 (29.41)	18 (15.13)	9 (69.23)	20 (33.90)	13 (10.48)	8 (47.06)
BT (Bleeding time)						
Normal	22 (32.35)	65 (54.62)	7 (53.85)	16 (27.12)	30 (24.19)	6 (35.29)
Prolonged	46 (67.65)	54 (45.38)	6 (46.15)	43 (72.88)	94 (75.81)	11 (64.71)
PT (Prothrombin time)						
Normal	45 (66.18)	81 (68.07)	11 (84.62)	33 (55.93)	68 (54.84)	12 (70.59)
Prolonged	23 (33.82)	38 (31.93)	2 (15.38)	26 (44.07)	56 (45.16)	5 (29.41)
APTT (Activated partial thromboplastin time)						
Normal	56 (82.35)	105 (88.24)	11 (84.62)	46 (77.97)	86 (69.35)	14 (82.35)
Prolonged	12 (17.65)	14 (11.76)	2 (15.38)	13 (22.03)	38 (30.65)	3 (17.65)
Platelet count						
Severe thrombocytopenia (<50,000/mm^3)	10 (14.71)	28 (23.53)	5 (38.46)	15 (25.42)	36 (29.03)	6 (35.29)
Thrombocytopenia	32 (47.06)	17 (14.29)	3 (23.08)	25 (42.37)	55 (44.35)	7 (41.18)
Normal	26 (38.24)	74 (62.18)	5 (38.46)	19 (32.20)	33 (26.61)	4 (23.53)

DISCUSSION

In present study, out of total 22,646 cases of fever 400 cases of malaria with equal number of male and female were included in the study. The most common age group in both male and female was 41-50 years which coincides with the findings of Srinivas et al but Preetham et al in their study mentioned 21-40 years as the most common age group.[4,5] This can be explained that the distribution of cases is variable from place to place and region to region based on the vector of transmission. The age group that is affected is predominantly the working age which is exposed mostly to fields and outdoor areas. In present study the percentage of people affected above 60 years was only 6%.

In present study, 243 (60.75%) of cases were falciparum positive and 127 (31.75%) were vivax positive and 30 (7.5%) cases presented with both vivax and falciparum positive. As per the WHO report 2016, the incidence of falciparum malaria is more than vivax with 60% of malaria cases reported are due to *P. falciparum* which is also seen in our study.[6] Similar findings were reported by

Rajansthein et al with falciparum malaria 76.2% and vivax 23.8%.[7]

Fever was the most predominant complaint in our study, that is 100% of cases presented with fever followed by chills, 83% in both male and female. These findings are on par with findings of Preetham et al, Mehtha et al who reported almost 100% with fever and 87% of chills in their study.[5,8] 67% of males and 69% of females complained of fatigability which is also reported by Ramana and Reddy et al in their study.[9] Fatigability was commonly a complaint in patients with anemia. Vomiting was present in 36.75% of cases in the study with 38% in males and 35.5% in females. These findings correlated with findings of Mehta et al who reported 43.3%, and 38% of cases in study of Ramana and Reddy et al.[9] Altered sensorium was noticed in 26.75% of cases with 35.5% in females and 18% in males. This finding was mostly seen in females than males in present study. Seizures were observed in 19% of females and 11.5% of males in our study which correlates with the findings of Newton SR et al who reported 18% in falciparum cases in his study.[10]

Pallor was noticed in 80.5% of males and 71% of females which was an unusual finding in present study. These findings were in contrary to the findings of Sen et al who reported more cases of pallor in females than males in his study.[11] Icterus was noted as an atypical presentation in 19% of male and 17.5% of female cases in present study and out of 71 cases of icterus in the study, 48 cases were of falciparum malaria. These findings correlated with the findings of Himanshu das et al (16%) and Nand et al (18%).[12,13] Splenomegaly was noticed in 71% of cases in present study with 74.5% in males and 67.5% among females. Out of 284 cases of splenomegaly, 174 were seen in falciparum malaria and 110 in vivax malaria. These findings are on par with findings of Harris VK et al who reported more cases of splenomegaly in falciparum malaria than vivax malaria.[14]

Hepatomegaly was noticed in 41% of cases with 65% in males and 17% in females. This finding in present study correlated with findings of Harris VK et al who reported more cases of hepatomegaly in falciparum than vivax malaria.[14] Petechiae was noticed in 36.5% of males and 28.5% of females in the study. Meningeal irritation was seen in 15% of cases with 18% in males and 11.5% in females. This can be explained with more number of falciparum cases in males than females. Findings of present study were on par with findings of Garg et al.[15]

16 cases of cerebral malaria were identified in the study with 12 males and 6 female cases out of which, 13 were of falciparum malaria and 3 were vivax malaria. These findings were on par with findings of Bajiya HN et al.[16] In present study, 4 cases were identified as ARDS due to malaria and 1 with circulatory collapse and considered as cases of severe malaria as per the criteria of WHO, and all the cases were of falciparum malaria.

Laboratory indices

In present study, severe anemia was seen in 82 cases with 51 females and 31 males. 43.9% were of falciparum, 39.02% of vivax and 17.07% with both falciparum and vivax cases. Severe anemia was seen in more cases of falciparum malaria in our study and was comparable with findings of Phillips R with more cases of severe anemia in falciparum than vivax.[17] ESR was heavily raised in 119 cases (29.75%) with 31 males and 88 females in the study. 55.96% were of vivax malaria, 48.78% in falciparum malaria and 21.95% among both cases. This finding was unusual in present study which is contrary to findings of Francischetti et al who reported raised ESR in falciparum cases than vivax malaria.[18] Raised levels of SGOT and SGOT were seen in 88 (22%)cases in total study with 47 males and 41 females. However, in present study, 40 cases were seen among falciparum malaria, 31 among vivax malaria and 17 in mixed infection. This finding in present study was comparable with findings of Miller LH et al.[19] Raised BT was seen in 244 cases (61%) with 106 males and 138 females. BT was raised in 89 cases of vivax, 148 cases of falciparum and 17 cases of mixed infections. PT was raised in 150 cases with 49 in vivax malaria, 94 cases of falciparum and 7 cases in mixed infections. Prolonged APTT was seen in 82 cases with 25 cases of vivax, 52 cases of falciparum malaria and 5 cases of mixed infections. These findings from present study were comparable with findings of Jayshankar et al, Mohanthy et al.[20,21] Severe thrombocytopenia (<50,000/mm^3) was observed in 100 cases (25%) with 25 cases in vivax, 64 cases of falciparum and 11 cases of mixed infections. These findings were comparable with findings of Shlee et al, Ghosh K et al.[22,23]

CONCLUSION

To conclude falciparum malaria was more common than vivax malaria in present study which is explained by the fact that the study was done in a tertiary care hospital and region is an endemic zone for falciparum malaria. Fever, chills, and vomiting were most common symptoms followed by common symptoms of pallor, anemia, splenomegaly. Severe anemia, ARDS and circulatory collapse were also observed in the study. All the laboratory indices BT, PT, APTT were prolonged with severe thrombocytopenia. Platelet counts were lowered in more cases of falciparum malaria than vivax malaria

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