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A Study of Clinical Features, Laboratory Profile, Outcome of Malaria Patients Admitted In PBM Children Hospital, Bikaner

Sapre A*, Tanwar GS**

*Resident, **Associate Professor

Department of Pediatrics, S.P. Medical College and Associated Group of Hospitals, Bikaner, Rajasthan, India.

Correspondence Author: Dr. Anuja Sapre, Resident, Sardar Patel Medical College and Associated Group of Hospitals, Bikaner, Rajasthan (India) – 334003

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Introduction

Aim : To study the epidemiology and clinico-laboratory profile with clinical outcome of admitted children suffering from malaria.

Material & Method : This prospective hospital based study was carried out on the children admitted in PBM Hospital, S.P. Medical College. Total 126 patients with plasmodium mono infection were analysed in this study.

Results : Out of total 126 children included in study, 116 (92.1%) children had vivax malaria monoinfection and the remaining 10 children (7.9%) were positive for falciparum malaria. Fever was present in all (100%) children presenting with malaria, while thrombocytopenia was present in 83(65.9%) children and severe anemia was present in 55(43.7%) children. Bleeding was present in 12(9.5%) of cases; hematuria being the most common complaint. Hepatic dysfunction was also present in 12(9.5%) children. Renal dysfunction was present in 8(6.4%) children. ARDS was present in 5(4.0%), shock was present in 2(1.6%) children while only 1 patient had hypoglycemia as presenting complaint.

Conclusion : Plasmodium *vivax* can manifest as severe malaria with all its complications as seen with P. *falciparum*. Thus, it challenges the perception of P. vivax as a benign disease. Fever, anaemia and splenomegaly are the commonest clinical features of malaria. WHO definition of severe malaria and knowledge of epidemiological background helps in early identification of high risk children, so that prompt treatment is given.

Keywords: Plasmodium Falciparum, Monoinfection, Hematuria, Hypoglycemia.

Background

Traditionally Plasmodium *falciparum* (Pf) is considered responsible for severe malaria and mortality due to malaria. In 2016, there were an estimated 4,45,000 deaths from malaria globally majority of which occur in association with infection with P. *Falciparum*[1]. However there is growing evidence that Plasmodium *vivax* (Pv) is responsible for a significant burden of disease worldwide[2]. More than 80% of the global P. vivax burden is contributed by 3 countries including India[3]. Although *P. vivax* malaria is considered to be benign malaria with a very low case-fatality ratio, it may still cause a severe and debilitating febrile illness as in *P. falciparum* malaria, especially in children. Studies from Asia and the Pacific region have shown that *P. vivax* malaria accounts for a substantial proportion of hospitalized patients. The dominant paradigm of *P. vivax* being a benign infection has been challenged recently by studies from India, Indonesia, Papua New Guinea, and Pakistan, which

documented hospitalization and severe disease including deaths in patients of *P.vivax* monoinfection. Population-based studies in Venezuela have also showed a rising trend in deaths associated with *P. vivax* malaria, particularly in children. There are many case reports on various clinical manifestations of severe *P. vivax* malaria in children from different parts of the world including India[4]. The clinical features of malaria vary from mild to severe, according to species of parasite present, the patient's state of immunity, the intensity of infection and also the presence of concomitant conditions such as malnutrition or other diseases[5].

Therefore this hospital based study was conducted to find out epidemiology, clinical manifestations and laboratory features in children of severe malaria.

Material and Methods

This prospective hospital based study was carried out in the children admitted in PBM, children Hospital, Sardar Patel Medical College, Bikaner from September 2015 to August 2016. Total 140 children with diagnosis of malaria were enrolled. Nine children having other co-morbidities along with malaria and 5 children having mixed plasmodia infection were excluded. Thus, 126 patients with plasmodium mono infection were analysed in this study.

Inclusion Criteria

1. Patients of either sex, age less than 15 years.
2. Patients with P. vivax or P. falciparum infection confirmed with microscopic examination and/or RDT.
3. No Dengue fever infection confirmed by IgM Antibody titre.
4. Those willing to provide written informed consent and comply.

Exclusion Criteria

1. Malaria patients with history of significant systemic diseases like autoimmune disorders, chronic liver diseases, psychiatric illness and bleeding disorder etc. as judged by history and physical examination.

2. Malaria patients having mixed infection.

3. Co-infection with Dengue fever.

4. Subjects unwilling to consent for the study.

In children selected for this study, diagnosis of malaria was made with peripheral blood smear examination and rapid diagnostic test i.e. Optimal test and Falcivax test. On the day of admission, detailed history was taken regarding duration and type of fever, abdominal pain, headache, vomiting, convulsion, urine output and bleeding tendencies. Thorough clinical examination was done. Temperature, pulse, respiratory rate, blood pressure, pallor, icterus, petechiae/ecchymosis, liver and spleen size and consistency were recorded. Central nervous system examination was done in case of relevant history.

Rapid Antigen Test

OPTIMAL is a rapid malaria detection test which utilizes a dipstick coated with monoclonal antibodies against the intracellular metabolic enzyme parasite lactate dehydrogenase (pLDH).

FALCIVAX is a two site sandwich immunoassay utilizing whole blood for the detection of P. *falciparum* specific histidine rich protein (Pf.HRP-2) and P. *vivax* specific pLDH.

Polymerase Chain Reaction analysis

To detect parasite DNA, highly sensitive and specific for detecting mixed infections, in particular at low parasite densities. The PCR confirmation was done in all the children having severe manifestations with evidence of *P. vivax* monoinfection on PBF and/or RDT. The PCR studies were targeted against the 18S ribosomal RNA gene of the parasite and used 1 genusspecific5¢ primer and 2 species-specific 3¢ primers in the same reaction mixture. Some of the primer sequences were modified for this study:

1. 5¢–ATCAGCTTTTGATGTTAGGGT ATT–3¢, genus specific;
2. 5¢–TAACAAGGACTTCCAAGC–3¢, *P. vivax* specific; and
3. 5¢–GCTCAAAGATACAAATATAAGC–3¢, *P. falciparum* specific

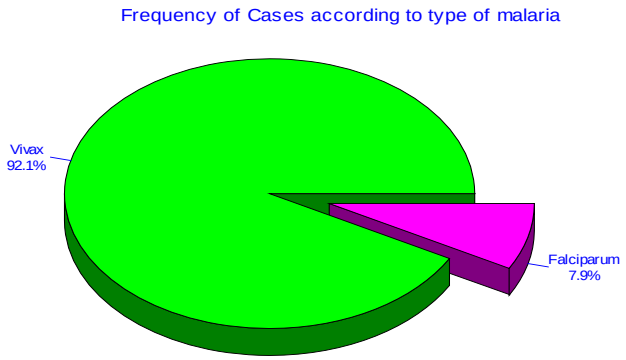
Each sample was subjected to a minimum of four rounds of PCR with various template amounts to eliminate overlooking *P. falciparum* co- infection.

RESULTS

Table 1

Frequency of Cases according to type of malaria

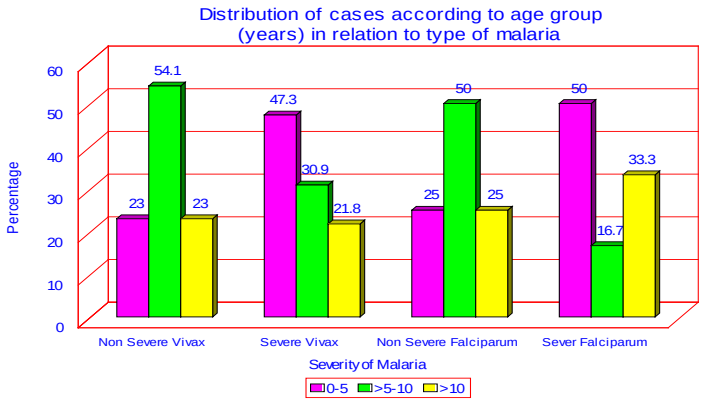
Type of Malaria	No. of Cases	Percentage
Vivax	116	92.1
Falciparum	10	7.9
Total	126	100



Out of total 126 children included in study,116 (92.1%) children had vivax malaria monoinfection and the remaining 10 children (7.9%) were positive for falciparum malaria.

Table 2: Distribution of Cases according to age group (years) in relation to severity of malaria

Severity of Malaria	Age Group (years)		
	0-5	>5-10	>10
	No (%)	No (%)	No(%)
Non Severe Vivax	14(23.0)	33(54.1)	14(23.0)
Severe Vivax	26(47.3)	17(30.9)	12(21.8)
Non Severe Falciparum	1(25.0)	2(50.0)	1(25.0)
Sever Falciparum	3(50.0)	1(16.7)	2(33.3)



In 61 non severe vivax malaria children, 14(23%), 33(54.1%) and 14(23.0%) children were in the age group of 0-5, >5-10 and >10 years respectively. In 55 severe vivax malaria children, 26(47.3%), 17(30.9) and 12(21.8%) children were in age group of 0-5, >5-10 and >10 years respectively.

In non severe falciparum malaria group out of total 4 cases 1child was below 5, 2 children were in the age group >5-10 years and 1 child was more than 10 years of age. In a total 6 severe falciparum malaria group children 3 children were less than 5 years of age, 1child was in the age group>5-10 years of age and 2 were more than ten years of age.

Table 3: Frequency of presenting complaints

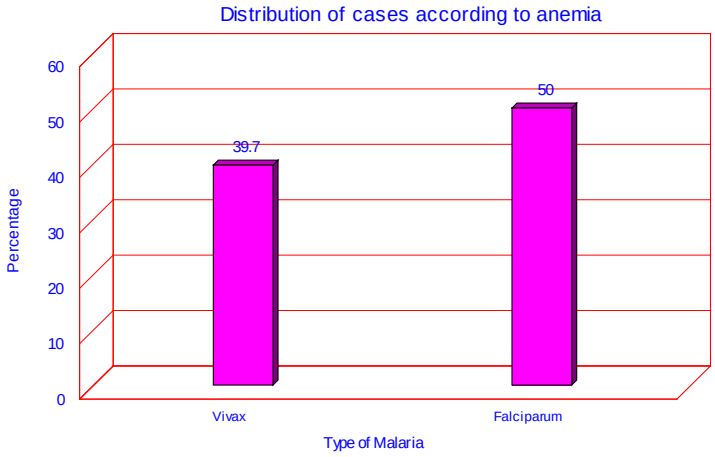
Complaints	No. of Cases (%)
Fever	126(100)
Thrombocytopenia	83(65.9)
Severe Anaemia	55(43.7)
Bleeding • Epistaxis	12(9.5) 3

• Hematuria • Gum Bleeding • Melena • Hematemesis	6 1 3 1
Hepatic Dysfunction	12(9.5)
Renal Dysfunction	8(6.4)
ARDS	5(4.0)
Cerebral Malaria • Convulsion • Altered Consciousness	4(3.2) 3 2
Shock	2(1.6)
Hypoglycemia	1(0.8)

Fever was present in all (100%) children presenting with malaria, while thrombocytopenia was present in 83(65.9%) children and severe anemia was present in 55(43.7%) children. Bleeding was present in 12(9.5%) of cases; hematuria being the most common complaint. Hepatic dysfunction was also present in 12(9.5%) children. Renal dysfunction was present in 8(6.4%) children. ARDS was present in 5(4.0%), shock was present in 2(1.6%) children while only 1 patient had hypoglycemia as presenting complaint.

Table 4: Distribution of cases according to severe anemia

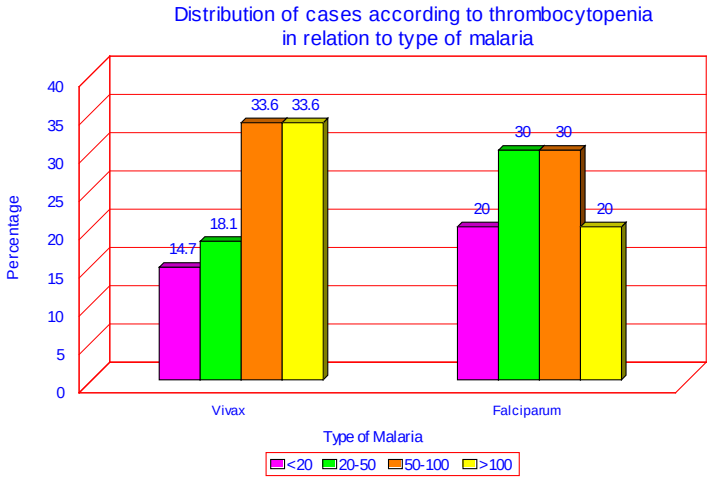
Type of Malaria	Severe Anaemia (%)
Vivax	50(39.7)
Falciparum	5(50.0)



In 116 vivax malaria children, 50(39.7%) children had anaemia while out of 10 falciparum positive malaria children 5(50%) had anaemia.

Table 5: Distribution of cases according to thrombocytopenia in relation to type of malaria

Type of Malaria	Platelet Count (thousands)			
	<20	20-50	50-100	>100
Vivax	17(14.7)	21(18.1)	39(33.6)	39(33.6)
Falciparum	2(20)	3(30)	3(30)	2(20)



In a total of 116 vivax malaria positive children, 77(66.4%) children had platelet counts ≤1 lacs while in falciparum malaria positive children 8(80%) of cases had platelet counts ≤1 lacs. Severe thrombocytopenia (platelet counts <20,000) was present in 17 vivax malaria positive children and in 2 children positive for falciparum malaria. 21children infected with P. *vivax* and 3 children infected

with P. *falciparum* had platelet counts in between 20,000 to 50,000.

Table 6: Comparison of different parameters in falciparum malaria group in relation to severity of malaria

Parameters	Severe Malaria		Non Severe Malaria		t	P
	Mean	SD	Mean	SD		
Age	6.25	4.44	7.50	3.11	0.484	0.641
Hb	5.27	0.45	8.20	2.73	2.660	0.029
Platelet Count	55333.33	40711.99	90625.00	85367.22	0.891	0.399
TLC	8516.67	5475.91	6250.00	4398.11	0.689	0.510
ESR	54.17	22.26	45.50	36.57	0.471	0.650
Blood Urea	85.00	63.16	34.25	5.32	1.571	0.155
Serum Creatinine	1.65	0.95	1.05	0.24	1.212	0.260
SGOT	80.67	28.72	68.90	87.61	0.313	0.762
SGPT	78.17	30.91	72.89	91.60	0.134	0.897
Total Bilirubin	1.70	0.95	1.53	1.34	0.243	0.814

Table no.6 shows comparison of different parameters in children with falciparum malaria in relation to severity of malaria. When we compared different parameters like age, platelet count, TLC, ESR, blood urea, serum creatinine, SGOT, SGPT and total bilirubin no statistical significant difference was found between severe malaria and non severe malaria ($p>0.05$ in all) while hemoglobin had a significant difference between severe and non severe malaria ($p<0.05$).

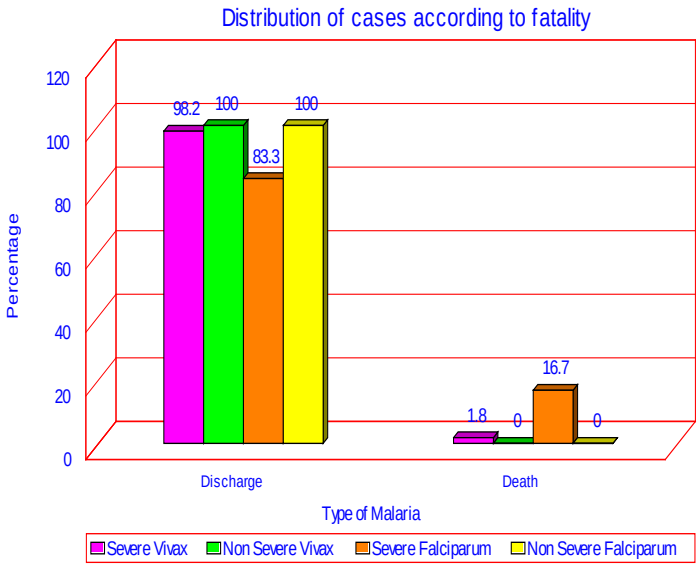
Table 7: Comparison of different parameters in vivax malaria in relation to severity of malaria

Parameters	Severe Malaria		Non Severe Malaria		t	P
	Mean	SD	Mean	SD		
Age	6.46	3.60	7.93	3.34	2.279	0.024
Hb	6.92	1.72	9.66	1.50	9.163	**<0.001**
Platelet Count	76156.36	98161.56	104508.19	67870.61	1.824	0.071
TLC	7560.00	5589.52	8724.59	4718.74	1.216	0.226
ESR	33.54	21.35	28.13	12.88	1.672	0.097
Blood Urea	52.77	53.57	33.34	6.56	2.810	0.006
Serum Creatinine	1.92	5.28	0.99	0.44	1.364	0.175
SGOT	129.71	247.12	45.26	34.42	2.642	0.009
SGPT	106.65	173.20	45.07	36.34	2.713	0.008
Total Bilirubin	1.43	1.03	0.91	0.33	3.693	**<0.001**

Table no. 7 shows comparison of different parameters in children suffering from vivax malaria in relation to severity of malaria. When we compared different parameters like platelet count, TLC, ESR and serum creatinine no statistical significant difference was found between severe malaria and non severe malaria ($p>0.05$ in all) while when we compared age, blood urea, SGOT and SGPT between severe and non severe malaria group the difference was found statistically significant ($p<0.01$).Hemoglobin and total bilirubin had statistically highly significant difference ($p<0.001$) when we compared these parameters between severe and non severe malaria groups.

Table 8: Distribution of cases according to fatality

Outcome	Malaria			
	Vivax		Falciparum	
	Severe (%)	Non Severe (%)	Severe (%)	Non Severe (%)
Discharge	54(98.2)	61(100)	5(83.3)	4(100)
Death	1(1.8)	0	1(16.7)	0



In our study, we had 2 mortality. One child was severe vivax malaria and the other child had severe falciparum malaria. Rest all other children recovered and were discharged from the hospital.

Conclusion

Plasmodium *vivax* can manifest as severe malaria with all its complications as seen with P. *falciparum*. Thus, it challenges the perception of P. vivax as a benign disease. Fever, anaemia and splenomegaly are the commonest clinical features of malaria. WHO definition of severe malaria and knowledge of epidemiological background helps in early identification of high risk children, so that prompt treatment is given.

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