A COMPARATIVE STUDY OF EFFECT OF P. FALCIPARUM AND P. VIVAX MALARIA ON PLATELET COUNT

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Abstracts: **Background & objectives:** Malaria is a big menace in India affecting almost 24 million peoples and causing 2.4 deaths per 1, 00,000 populations annually. Malaria affects almost all the organs of body but varieties of typical hematological alterations have been reported. Present study aims to evaluate impact of malaria on platelet count and species specific changes if any. **Methods:** This study was carried out in Deendayal Upadhyay Govt. Medical College and Hospital, Rajkot 100 known hospitalized cases of malaria. All the hematological parameters including platelet count were tested by SYSMAX KX21 auto analyzer and statistically analyzed among different species**. Results:** Out of 100 patients, 37 were P. falciparum and 63 were P. vivax cases. 91 cases had thrombocytopenia. 97.29% (36 out of 37) cases with P. falciparum and 87.30% (55 out of 63) cases with P. vivax had thrombocytopenia amongst them 29.73% (11 out of 37) of P. falciparum and 6.35% (4 out of 63) cases with P. vivax had severe low platelet count. The mean values of platelet count are lower than normal in both the infections and statistically significant difference (P value - 0.0071) is seen between P. falciparum and P. vivax. **Conclusion:** Thrombocytopenia is the leading hematological alterations seen in malaria with statistically significant difference in severity being more deteriorating in P. falciparum cases than P. vivax cases.

Key words: Malaria, Platelet count, Plasmodium falciparum, Plasmodium vivax.

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Introduction:

Malaria is an acute febrile illness caused by infection with parasite of the genus plasmodium and transmitted to man by certain species of infected female anopheles mosquitoes. At present about 100 countries in the world are considered endemic. Malaria affects 219 million peoples worldwide taking toll of 6, 60,000 peoples annually[1].

Malaria is a big menace in India affecting almost 24 million peoples[1] and causing 2.4 deaths per 1, 00,000 population annually[2].

In malaria a prompt and accurate diagnosis is the key to effective treatment. Acute febrile illnesses like arboviral infection, leptospirosis, enteric fever or viral fever are difficult to distinguish from malaria based on clinical ground alone because clinical presentation of malaria is very diverse. Microscopic diagnosis by peripheral smear examination is the established method for laboratory diagnosis of malaria. But it requires technical expertise and repeated smear examination. However it may be wasteful if poorly executed and in less experienced hands[3].

It is very essential to know basic epidemiological characteristics, haematological and clinical parameters of malaria pertaining to our territory to understand the problem. Malaria affects almost all the organs of body but varieties of typical haematological alterations have been reported.

Present study aims to evaluate impact of malaria on haematological parameters specifically platelet count and species specific changes if certain haematological indices would increase the diagnostic probability of malaria.

Material and Methods:

This cross sectional study was carried out in Pandit Deendayal Upadhyay Govt. Medical College and Hospital, Rajkot which is a tertiary referral center from June 2012 to May 2013 in 100 known cases of malaria which includes 37 P. falciparum cases and 63 P. vivax cases with the approval from Institutional Ethics Committee.

Patients between the age group 21-60 years attending medicine clinics and hospitalized with either the complain of fever, chills, rigor, headache, vomiting and peripheral smear positive for malaria parasite were included in the study.

Cases with associated systemic condition (Dengue, Pneumonia, Meningitis, Skin infection etc.), pregnancy, associated hematological disorders (Genetic disorders, haemoglobinopathies), H/o blood transfusion or blood donation for last 3 months and on any medication were excluded from the study.

Detailed history regarding age, sex, nature and duration of illness, history of blood transfusion and informed consent were taken. Clinical examination findings were noted. Thin blood smears were prepared using fresh blood sample and stained with Field's stain. Species identification of parasite was reported after examining smear dually confirmed by pathologist in Central Clinical Laboratory. Venous blood was collected in EDTA Vacutee. All the hematological parameters including platelet count were measured using EDTA blood sample in Sysmex KX21 automated hematology analyzer.

Data were calculated and statistically analyzed with the help of software Graphpad-Prism. The results were compared using students unpaired't' test.

Result:

Table-1 shows Hematological profile in all patients of malaria. Mean value of platelet count in P. falciparum cases in our study was 0.497±0.358 and for P. vivax cases was 0.916±0.883. Unpaired student't' test show statistically significant difference (P value < 0.05).

Table: 1: Haematological parameters in P. falciparum & P. vivax malaria.

PARAMETER	P.FALCI (n=37) (Mean ± SD)	P.VIVAX (n=63) (Mean ± SD)	P Value
Haemoglobin (gm/dl)	9.17±2.65	11.21±2.43	0.0002*
RBC Count (10^6/mm^3)	3.30±1.08	4.14±1.04	0.0002*
Haematocrit (%)	27.73±8.19	34.57±6.92	0.0001*
Platelet Count (10^5/mm^3)	0.497±0.358	0.916±0.883	0.0071*
WBC count (10^3/mm^3)	7.36±4.82	6.50±3.23	0.2863
*P value < 0.05			

Table-2 shows that total 100 cases were included in our study amongst them 37 patients had P. falciparum malaria and 63 patients had P. vivax malaria. In our study number of cases of P. vivax was more than P. falciparum. Out of 100 cases, 72 were males and 28 females. The number of males (72%) affected in our study was more than females (28%). The male to female ratio is 2.57:1.

Table: 2: Distribution of parasite species.

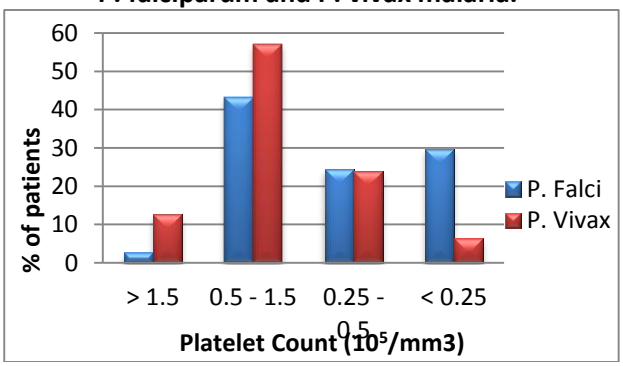
SEX	P.FALCI	P.VIVAX	TOTAL
MALE	28	44	72
FEMALE	9	19	28
TOTAL	37	63	100

Table-3 shows that in our study, 91 cases had thrombocytopenia. 52 cases had mild, 24 cases had moderate and 15 cases had severe thrombocytopenia. 97.29% (36 out of 37) cases with P. falciparum had thrombocytopenia, amongst them 29.73% (11 out of 37) had severe thrombocytopenia. 87.30% (55 out of 63) cases had thrombocytopenia in patients infected with P. vivax including 6.35% (4 out of 63) cases with severe low platelet count.

Table: 3: Platelet counts in P. falciparum (P.F.) and P. vivax (P.V.) malaria.

PLATELET COUNT (10^5/mm^3)	P. F.	%	P.V.	%	TOTAL	TOTAL %
> 1.5	1	2.71	8	12.70	9	9
0.5 – 1.5	16	43.24	36	57.14	52	52
0.25 - 0.5	9	24.32	15	23.81	24	24
< 0.25	11	29.73	4	6.35	15	15
TOTAL	37	100	63	100	100	100

Graph: 1: Comparison of platelet count in P. falciparum and P. vivax malaria.



So, thrombocytopenia is significant finding in cases with malaria predominantly seen in P. falciparum

infection. Severe thrombocytopenia is also more common in cases with P. falciparum infection.

Discussion:

The present study was undertaken from June 2012 to May 2013 in 100 known cases of malaria in Rajkot. Out of which, 37 patients had P. Falciparum and 63 had P. vivax malaria. In the study done by *Jadhav et al* [4] at New Mumbai, there were 62.17% P. vivax, 37.69 % P. falciparum and 0.04% mixed cases of malaria. While in the study done by *Smita and Harish Chandra* [5] at Dehradun, Uttarakhand 69.8% P. vivax, 27.5% P. falciparum and 2.7% mixed infection cases were observed. In the study done by *Rasheed et al* [6] at Quetta, Pakistan there were 62% P. falciparum, 19.9% P. vivax and 18.1% mix infection. In the study done by *Akhtar et al* [7] at Nagpur, Maharashtra there were 52.71% P. falciparum, 36.48% P. vivax and 10.81% mix infection. The prevalence of malaria according to species is different in different regions. In our region P. vivax is more common than P. falciparum.

In our study the number of males (72%) affected were more than females (28%). The male to female ratio is 2.57:1. In the study done by *Erhart et al* [8], 69% males and 31% females were affected. The male to female ratio is 2.23:1. In the study done by *Lathia et al* [3], 61% males and 39% females were affected. The male to female ratio is 1.56:1. In the study done by *Haroon et al* [9], 75% males and 25% females were affected. The male to female ratio is 3:1. Males are more prone to malaria because they are more prone for exposure to risk factors like travelling to various endemic areas for malaria, working in farms and other places with frequent exposure to mosquito bites.

In our study thrombocytopenia is seen in 91% among the total smear positive cases. 52% cases had mild, 24% cases had moderate and 15% cases had severe thrombocytopenia. *Haroon et al* [9] reported 87% cases had thrombocytopenia with 22% cases having severe thrombocytopenia. In the study done by *Madiya et al* [10], 63% cases had thrombocytopenia with 16% cases having severely low platelet count. In the study done by *Faseela et al* [11], 83% cases had thrombocytopenia with 9% cases having severe thrombocytopenia. In the study done by *khan et al* [12], 70% had thrombocytopenia with 9.6% cases having severe thrombocytopenia. In the study done by *Umang et al* [13], 100% cases had thrombocytopenia with 10% cases having severe thrombocytopenia.

In present study 97.29% (36 out of 37) cases with P. falciparum had thrombocytopenia including 29.73% (11 out of 37) cases with severe thrombocytopenia. 87.30% (55 out of 63) cases had thrombocytopenia infected with P. vivax including 6.35% (4 out of 63) cases with severe low platelet count. *Madiya et al* [10] reported that thrombocytopenia was more commonly observed with P. falciparum (74%) and less with P. vivax (14%); was also seen in two cases with mixed infection. Thrombocytopenia is more common in P. falciparum than P. vivax in the studies done by *Haroon et al* [9], *Madiya et al* [10] and *Umang et al* [13].

In our study mean platelet count in falciparum malaria was 0.497±0.358 lac/cumm and in vivax malaria was 0.916±0.883 lac/cumm. In the study done by *Jadhav et al* [4] at New Mumbai the mean platelet count in P. vivax malaria was 1.15lac/µl (SD 0.64) as against P. Falciparum malaria where the mean platelet count was 1lac/µl (SD 0.75) with a statistically significant difference($p < 0.0001$). In the study done by *Aslam et al* [14] mean platelet count in falciparum group was 84.7 $X10^9$/l, in vivax group 113 $X10^9$/l and in mixed infection cases it was 82 $X10^9$/l. *Soham et al* [15] concluded that mean platelet count (lac/cumm) for falciparum malaria patients was 1.86±1.10 and for vivax patients was 1.93±1.03. So, thrombocytopenia is common in cases with malaria predominantly seen in P. Falciparum infection. Thrombocytopenia is a key finding in malaria. Low platelet count has been consistently found in cases of P. falciparum and P. vivax malaria.

The suggested mechanisms for thrombocytopenia may be splenic pooling of platelets, antibody (Ig G) mediated platelet destruction, dysmegakaryopoiesis, platelet aggregation and activation, parasite invasion of platelets, platelet phagocytosis by macrophages secondary to elevated M-CSF, platelet adhesion to erythrocytes, oxidative stress and or disseminated intravascular coagulopathy [11, 13, 14, 16, 17, 18, 19, 20].

The presence of thrombocytopenia is significantly associated with malaria. These findings along with a clinical suspicion should prompt a more diligent search for the malarial parasite. Our study group was limited to P. D. U. Govt. hospital, Rajkot only and hence a better picture of thrombocytopenia in malaria can be better studied if we take larger sample size.

Conclusion:

Malaria has a significant impact on hematological profile markedly on platelet count. Out of the two species P. falciparum infection causes maximum drop in platelet count followed by P. vivax malaria. Presence of thrombocytopenia in a patient with acute febrile illness in the tropics increases the probability of malaria. This may be used in addition to the clinical and microscopic parameters to heighten the suspicion of this disease and prompt initiation of the therapy.

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