A STUDY OF SPECTRUM OF MALARIA WITH SPECIFIC REFERENCE TO PLASMODIUM VIVAX

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ABSTRACT

INTRODUCTION: Malaria is one of the most common infectious diseases and a great public health problem worldwide, particularly in Africa and south Asia. P.falciparum is well known for severe complicated malaria while P. vivax malaria (benign tertian malaria) so far, was considered to have a benign course that causes disease resulting in lower case-fatality rates. Plasmodium vivax is now recognized as a cause of severe and fatal malaria. In this study the clinical profile of patients with malaria with regards to demographic, clinical and biochemical profile and its complications was done with specific reference to vivax malaria.

AIMS AND OBJECTIVES: The aim of our study was to present the clinical features, hematological and biochemical profile of malaria with specific reference to Plasmodium vivax and to present the comparative study of complications and outcome of P. vivax, P.falciparum and mixed infection (vivax + falciparum).

MATERIALS AND METHODS: This was a prospective observational study done at a tertiary care hospital in Jaipur over 12 Months period. All diagnosed cases of malaria, including P.vivax, P.falciparum and mixed infections were studied and their demographic profile, complications and course of disease were noted. Data was analyzed using appropriate statistical tests.

RESULTS: 210 cases of malaria were included in the study and out of them 120 were infected with P.vivax and 63 with P. falciparum. Severe disease was present in 18 (15%) cases of vivax malaria and 33 cases (52%) of falciparum malaria. A mixed infection was found in 27 cases and out of them 14 were of severe category (52%). The complications seen in vivax malaria were: thrombocytopenia (75.7%), ARDS (1.61%), malarial hepatitis (14.28%), acute renal failure (13.8%), cerebral malaria (11%) and the mortality in vivax and falciparum malaria cases was 1.75% and 3.64% respectively.

CONCLUSIONS: Plasmodium vivax is a cause of severe and fatal malaria despite its low parasite biomass. The incidence of ARDS, thrombocytopenia, leukocytopenia, in P.vivax malaria was as higher as compared to P.falciparum or mixed infection, while renal, hepatic, lung and cerebral involvement were seen with increasing frequency in falciparum malaria and mixed malaria cases.

KEY-WORDS: Fever, Malaria, Plasmodium vivax, Thrombocytopenia.

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INTRODUCTION

Malaria is one of the most common infectious diseases. India contributes 77% of the total malaria in Southeast Asia. In India about 2-3 million confirmed malaria cases and 1,000 deaths are reported annually.[1] Of the 4 most common species that infect humans, P.vivax and P.falciparum cause 95% of infections.[1,2] P.falciparum is well known for severe complicated malaria, while P. vivax malaria (benign tertian malaria) so far, was considered to have a benign course that causes disease resulting in a lower case-fatality rates. However, recently there have been many reports of vivax malaria with various complications. The pathogenesis of severe vivax malaria is quite intriguing. Taking these things into consideration, we plan to study the manifestations of various malarial sub-types with specific reference to vivax malaria and its complications.

METHODS AND MATERIALS

The study was hospital based comparative type of observational study conducted in an upgraded department of medicine at SMS Hospital, Jaipur where the study was approved by the hospital ethics committee. The diagnosed cases of malaria (malarial parasite in PBF and antigen detection assay) including adult patients with P.vivax, P.falciparum or mixed infections were included. A total of 210 patients with malaria were enrolled in the study during the study period. Routine haematological and biochemical investigations were carried out. The patients were evaluated for malaria by peripheral blood smear and Rapid Antigen test (OptiMAL test and histidine rich protein 2 detections). Malaria cases were divided into three groups: Group-A (P.vivax malaria), Group-B (P.falciparum malaria), Group-C comprised of mixed infection (vivax+falciparum).

Statistical Analysis: All the data obtained were presented as Mean±SD. Any difference in parameters between groups was tested for significance by ANOVA test. The p-value less than 0.05 was considered statistically significant and Chi square test was used for comparing proportions. All the statistical analyses were performed with SPSS for Microsoft windows version 20.

RESULTS

In our study total 210 patients suffering from malaria were included, out of them 126 (60%) were males and 84 (40%) were females. P.vivax infection was found in 120 cases (57.1%), P.falciparum infection was found in 30% cases (63 out of 210), Mixed infection was found in 12.8% cases (27 out of 210), out of which 16 cases (59.25%) were antigen positive for both P.vivax and P.falciparum, 9 cases (33.3%) were PBF positive for P.vivax and antigen test positive for P.falciparum and 2 cases (7.4%) in which PBF was positive for P.falciparum and antigen test positive for P.vivax**. (Figure 1,2,3**). Out of 120 cases of P.vivax malaria was found severe in 15% cases (18 out of 120) and P falciparum

infection was severe in 52% cases (33 out of 63) and mixed infection was also found severe in 52% cases (14 out of 27).

Clinical Features- No significant difference was observed in the clinical features in different groups except edema and icterus. Edema was more in Group B (7.93%) and Group C (7.41%), p value=0.05, icterus was more common in group C (25.93%). The maximum numbers of the patients having hepatosplenomegaly were observed in Group B. Hepatomegaly was seen in 15.8% patients (10 out of 63) and splenomegaly was observed in 42.85% patients (27 out of 63) **(Table 1).**

Hematological parameters- The overall mean hemoglobin was 10.81±2.413 gm% and it was lowest in Group B (P. falciparum) 10.28 ± 2.886 gm%, followed by Group C 10.37 ± 2.279 gm%. The mean TLC of the study group was 7.08±3.275 (10^3/mm3). The maximum number of the patients with leukocytopenia were seen in Group A 17.5% (21 out of 120). Thrombocytopenia was observed in 80.7% of P.vivax cases (Group A) and 72.73% of P.falciparum (Group B).**(Table 2)**

Complications - No significant difference was observed in the complications of different groups except hyperbilirubinemia, ARDS and cerebral malaria. Hyperbilirubinemia was more common in Group C (33.33%) as compared to the group A (4.39%) and group B (16.36%), (p value = <0.001). Out of total 210 cases, 08 (3.81%) cases showed ARDS and the majority of the patients with ARDS were found in Group C (7.4%) as compared to the Group B (6.39%), Group A (1.66%) (p value=<0.001) and the difference among different groups was statistically significant.

Cerebral malaria was more in group B (15.8%) as compared to group A (4.16%) and in group C (7.4%), p value=0.007 **(figure 4).** The mortality in P.vivax was 1.75% and 3.64% in P.falciparum. The highest mortality (3.7%) was observed in Group C including mixed infections. No Significant difference was observed according to mortality in different groups of malaria patients.

DISCUSSION

Vivax malaria has been considered as a benign disease. In the past few years, many cases of severe vivax malaria were seen with significant morbidity and mortality. Hence this study was done to find out various complications of malaria with special reference to vivax malaria. We studied clinical features, hematological and biochemical profile of 210 malaria cases with specific reference to Plasmodium vivax and the comparative analysis of complications and outcome of P. vivax, P.falciparum and mixed infection (vivax + falciparum) with or without concomitant infections. The male predominance was observed in all the groups but the difference among the groups was not significant. These results were in accordance with the study conducted by Milind Y Nadkar et al.[3] P.vivax infection was found in 120 cases out of total 210 cases followed by P.falciparum (63 cases).The detection rate of P.falciparum by PBF was higher than P.vivax. In 120 cases of P.vivax infection, severe malaria was found in 18 cases (15%). In P.falciparum infection, severe malaria was found in 33 out of 63 cases (52%) while the mixed infection was found

in 27 cases out of which 14 were severe (52%). The overall mean hemoglobin was 10.81±2.413 gm% and it was lowest in Group B (P. falciparum) 10.28 ± 2.886 gm%, followed by Group C 10.37 ± 2.279 gm%. The mean TLC of the study group was 7.08±3.275 (10^3/mm3). The maximum number of the patients with leukocytopenia were seen in Group A 17.5% (21 out of 120), The results of our study were in accordance with the study conducted by Charulata S Limaye *et al* in which total leukocyte count was low (<4000/cmm) in 66 (19.53%) cases of P.vivax, 38 (18.45%) of P.falciparum and 26 (19.12%) of mixed Infection.[4] The incidence of anemia in our patients (3%) was considerably less than that reported in studies by Tjitra *et al* in Southeast Asia (19%). Thrombocytopenia was the most common finding in all groups[5] and it was found in 159 cases (75.71%). Thrombocytopenia was observed in 80.70% of P.vivax cases (Group A) and 72.73 % of P.falciparum (Group B), which is consistent with the study conducted by Milind Y Nadkar *et al*.[3] Many cases of severe thrombocytopenia caused by vivax malaria have been reported in the literature.[3,4]

The incidence of malarial hepatitis was 4.16% (5 out of 120) in P.vivax, whereas it was 14.28% (9 out of 63) in P.falciparum. Malarial hepatitis due to microvascular sequestration of parasitized red cells causes a significant rise in serum bilirubin concentration, mild elevations of AST and ALT and prolongation of prothrombin time.[6] Out of total 210 cases, 29 (13.8%) patients showed Serum Creatinine more than 3 mg/dl and it was significantly more common in P.falciparum,12 out of 63 (19%) patients. The frequency of renal failure was 32% in severe P.vivax malaria and 55% in severe P.falciparum malaria in the study conducted by Milind Y Nadkar *et al.*[3]

Many cases of ARDS in vivax malaria have been reported from India and abroad.[7-12] Lung injury was associated with the inflammatory increase in alveolar capillary membrane permeability.[13] Out of total 210 cases, 08 (3.81%) cases showed ARDS. Maximum no. of patients with ARDS were found in Group C (7.4%) as compared to Group B (6.39%), Group A (1.66%) (p value=<0.001) and the difference among different groups was statistically significant. Our results are similar to the study conducted by Charulata S Limaye, et al.[4] Out of total 210 cases 17 (8.0%) cases showed evidence of cerebral malaria and it was more in group B (15.8%) as compared to group A (4.16%) and in group C (7.4%), p value=0.007 and the difference among different groups was statistically significant. The complications of vivax malaria observed by Sharma *et al*[14] in a study from Delhi were thrombocytopenia, hepatic dysfunction, renal failure, ARDS and hemolysis. Severe anemia and respiratory distress were also noted as complications of vivax malaria by Genton et al.[15] Mortality in P.vivax cases was 1.75% and 3.64% in P.falciparum. The highest mortality was in Group C, which comprised of mixed infection (3.7%). No Significant difference was observed according to mortality in different groups of malaria patients.

CONCLUSION

The results of our study have revealed that Plasmodium vivax is now recognized as a cause of severe and fatal malaria despite its low parasite biomass. It was previously

presumed that the severe disease with vivax infection is actually caused by coinfection of vivax and falciparum species, but severe vivax malaria is now very common with increasing mortality. In our study the maximum number of the patients with thrombocytopenia (80.70%) and severe thrombocytopenia 14.9% were seen in P.vivax malaria reflecting increased frequency and severity of this complication with P.vivax infection which was previously considered benign. The incidence of ARDS, thrombocytopenia, leukocytopenia, in P.vivax malaria was as higher as in P.falciparum or mixed malaria, while renal, hepatic, lung and cerebral involvement were seen with increasing frequency in mixed malaria cases.

Conflicts of Interest : Nil.
Source of Funding : None.

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FIGURES AND TABLES

FIGURE 1 Cases (%) of Plasmodium vivax

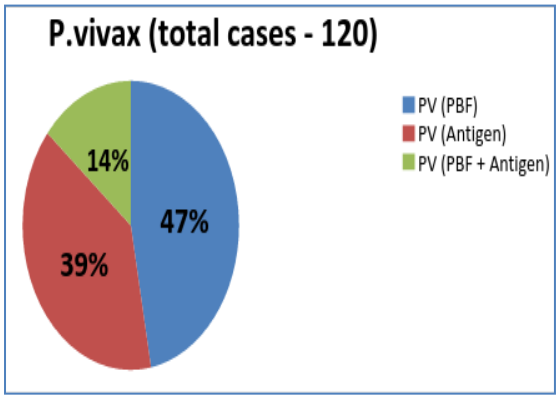

FIGURE 2 Plasmodium falciparum with its diagnostic tests

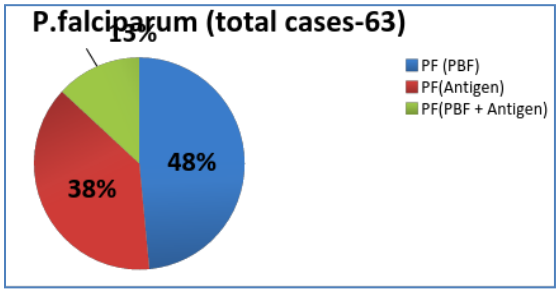

FIGURE 3

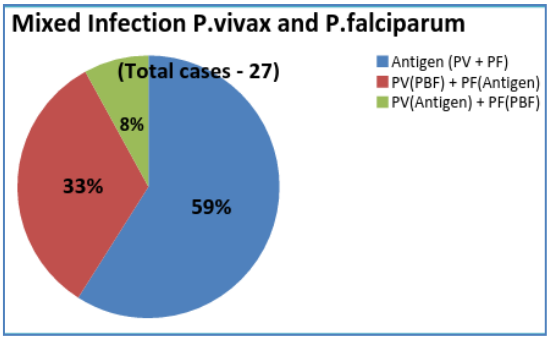

FIGURE 4 Cases with serious complications in different groups

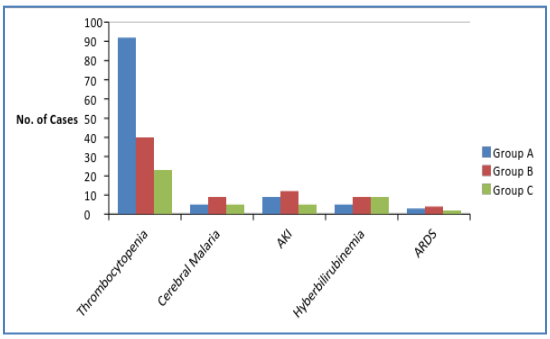

TABLE 1 : shows the clinical feature of different groups

Features	Group A (N=120)		Group B (N=63)		Group C (N=27)		Total	P Value
	No	%	No	%	No	%	No	
Pallor	9	7.5	8	12.6	4	14.81	21	0.65 NS
Edema	1	0.83	5	7.93	2	7.41	8	**0.05 S**
Icterus	5	4.16	5	7.93	7	25.93	17	**0.006 S**
Hepatomegaly	12	10.0	10	15.87	2	7.41	24	0.511 NS
Splenomegaly	47	39.1	27	42.85	11	40.74	85	0.2 NS

TABLE 2: shows the statistical analysis of hematological parameters in different groups

Group		**Hb (gm%)**	**TLC (10^3/mm^3)**	**Platelets (lakhs/ml)**
Group A (N=120) P.vivax	Mean	11.17	6.65	0.75
	Std. Deviation	2.234	3.182	0.667
Group B (N=63) P.falciparum	Mean	10.28	7.48	0.81
	Std. Deviation	2.886	3.059	0.689
Group C (N=27) **(PV+ PF)**	Mean	10.37	8.12	0.61
	Std. Deviation	2.279	3.691	0.515
Total (N=210)	Mean	10.81	7.08	0.74
	Std. Deviation	2.413	3.275	0.639
P value		0.105	0.135	0.526
		NS	NS	NS