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Paediatrics

"THE STUDY OF CLINICAL PROFILES OF VIVEX MALARIA IN COMPARISON WITH FALCIPARUM MALARIA IN CHILDREN: A TETIARY CARE HOSPITAL EXPERIENCE."

Dr. Akhilesh Kumar Ram

Senior Resident, Department of Paediatrics, Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi.

ABSTRACT

Background: Malaria remains an important cause of morbidity and mortality in children and adults in countries where it is endemic. Malaria due to Plasmodium vivax (P. vivax) is usually thought to be causing benign malaria with low incidence of complications as compared to P. falciparum but severe malaria due to P. vivax infection is increasingly observed now a days. Organ failure in vivax malaria is caused by mechanisms of inflammation as well as sequestration. In this study we have compared the clinical profiles complications in vivax malaria with those in falciparum malaria. **Objectives:** this study was done to compare the clinical profiles and complications of P. vivax with P. falciparum malaria mono infection in children. **Material and Methods:** This retrospective observational study included malaria patients who were admitted to paediatric indoor ward of Vardhman Mahavir Medical college Safdarjung hospital, New Delhi, a tertiary care teaching hospital, during a period from December 2019 to December 2020. Inclusion criteria were patients of age group <12 years in whom either P. falciparum or P. vivax was positive on rapid malaria antigen test or peripheral blood smear. Patients showing mixed infections were excluded from study. **Results:** A total of 75 subjects (mean age 5.5±3.3 years) were included in the study. It consisted of 43 cases of vivax malaria and 32 cases of P falciparum. The P. vivax cases consisted of 32 (74.4%) males and 11 (25.5%) females while P. falciparum cases consisted of 14 (43.7%) males and 18 (56.3%) females. There was no statistical significant difference found between clinical profiles as well as complications such as anaemia, thrombocytopenia, liver and renal dysfunction, ARDS, and cerebral malaria between P. vivax and P. falciparum. **Conclusion:** The present study conclude that P. vivax mono infection tends to have as similar clinical course and complications as compared to malaria due to P. falciparum mono infection in children.

KEYWORDS :

INTRODUCTION

Malaria is one of the major public health problems of the country. India reports around one million malaria cases an- nually and contributes 80% of Southeast Asia malaria bur- den[1]. It is one of the serious problems in our country due to inability to control disease in endemic areas, migration of the populations, and serious complication caused by the disease itself. In India, *P. falciparum and P. vivax* are the most common species causing malaria, their proportion being around 50% each. *P. falciparum* malaria causes more se- vere disease, mortality and morbidity so intensive measures have been implemented mainly against it. *Vivax Malaria* has long been considered to have a benign course with multi- ple relapses.[4,5] The typical complications seen in *falciparum malaria* are not usually found in vivax mono-infections. But there are few evidences in the past decade from studies in the countries of Asia that *P. vivax* is able to cause severe disease. *P. vivax* is now also getting recognized as a major cause of severe and fatal malaria despite its low parasite density, increased deformability of infected RBC & paucity of parasite sequestration. This may be due to its several im- portant biological differences accounting for these observa- tions, which are the development of the dormant stage in the liver (hypnozoites) causing relapse and greater transmission potential of *P. vivax* at low parasite densities. *P. vivax* is the most common geographically widespread species of *Plasmodium* causing malaria in human beings. This study was carried out to compare the clinical profiles and compli- cations of *P. vivax* with *P. falciparum* malarial infection in chil- dren in our hospital which is a tertiary care centre.

MATERIALS AND METHODS

It is a retrospective observational study. The study was conducted at Paediatric Department of Vardhman Mahavir Medical college & Safdargung hospital , New Delhi, a tertiary care teaching hospital. The study included malaria patients who were admitted to paediatric indoor ward of the hospital, during the period from December 2019 to December 2020. Inpatient records from December 2019 to December 2020 were retrieved and scrutinized by using a Performa on the basis of the patient's demographic profile, clinical findings, investigations, treatment and complications during this 12 month period. The institutional ethical committee approved the study.

Inclusion Criteria

All slide positive and rapid diagnostic tests (RDT) that con- firmed cases of malaria (*P. vivax* and *P. falciparum*) admit- ted and treated in Vardhman Mahavir Medical college & Safdarjung hospital, New Delhi.

Age group up to 12 years were included.

Exclusion Criteria

Those febrile patients with clinical diagnosis of malaria but without any evidence on smear or antigen testing for *P. vivax* and *P. falciparum* malaria.

Mixed Malarial infection of P. Falciparum and P. Vivax

The diagnosis and confirmation of species of *P. falciparum* and *P. vivax* malaria were established by thick and thin film of peripheral blood smear examination under oil immer- sion with giemsa stain and RDT. The rapid malaria antigen kit used in the present study was based on detection of lactate dehydrogenase (LDH) and histidine-rich protein-2 (HRP-2). Anaemia in this study was defined when Hb of pa- tient was ≤9 gm% while, raised ALT was defined when ALT elevated >3x upper limit of normal. Severe complicated malaria was categorized as per World Health Organization guidelines.[6] Severe complicated malaria in the form of cerebral malaria, severe anemia (Hb < 5mg/dL), thrombocytopenia (platelet count < 1 lac/cumm), pancytopenia, jaundice (S. Bilirubin >3mg/dL), acute renal failure (serum creatinine >3mg/dL), acute respiratory distress syndrome, and multiorgan dysfunction was included in this study. Routine laboratory investigations included a complete blood cell count, peripheral smear examination, blood indices, and platelet count and these were sent immediately after admission of all the patients. Urine examination, liver and renal function tests, coagulation profile, cerebrospinal fluid study, chest radiograph, and blood culture were done whenever it was indicated.

Statistical Analysis: Statistical analyses were performed by using SPSS version 16 software. The data of the two groups were compared using the Fisher or chi square test appropriate for each parameter in the study.

Table 1: Baseline Clinical profiles & Lab. parameters of patients.

Baseline characteristics	*P. vivax* (n = 43)	*P. falciparum* (n = 32)	All patients (n = 75)
Age (years, mean SD)	5.3 (3.2)	5.7 (3.4)	5.5 (3.3)
Gender (male/ female)	32/11	14/18	46/29
Weight for age (*z* score < −2)	5 (11.6%)	4 (12.5%)	9 (11.3)
Duration of fever (days, mean SD)	5.1 (4.01)	5.4 (2.6)	5.2 (3.3)
Length of hospital stay (days, mean SD)	4.5 (2.4)	5.0 (3.1)	4.7 (2.8)
Hemoglobin (gm%, mean SD)	7.80 (2.26)	8.1 (2.6)	7.97 (2.4)
Blood sugar (mg%, mean SD)	81.3 (16.02)	88.3 (13.2)	85.1 (14.7)

RESULTS

A total of 75 cases (mean age 5.5±3.3 yrs) were included in the study.

It consisted of 43 patients of *P. vivax* and 32 patients of *P. falciparum* . Baseline characteristics of both groups were similar without having any significant statisti- cal differences (Table 1). One patient of each of *P. vivax* and *P. falciparum* was expired. Fever was present in 100% of both *P. vivax* and *P. falciparum* cases. Anemia was pre- sent in 39.5% and 43.7% cases of *P. vivax* and *P. falcipa- rum,* respectively, while thrombocytopenia was present in 36.1% and 36.7% cases. Raised ALT and jaundice were present in 10.6% and 6.3% of *P. vivax* cases while the same were present in 6.2%and 9.3% cases of *P. falciparum*. ARDS was present in 4.2% cases of *P. vivax* and 3.1% cases of *P. falciparum*. Cerebral malaria was present in 4.2% and 6.2% of *P. vivax* and *P. falciparum* malaria cases, respectively. Bivariate relationship between clinical features and complications of P. vivax and P. falciparum malaria showed no statistical significant difference (Table 2)

Table 2: Comparison of various parameters between *P. vivax* and *P. falciparum* malaria at initial presentation.

Parameters	*P. vivax n* (%)	*P. falciparum n* (%)	*P* value
Splenomegaly	27 (62.7)	18 (56.2)	0.31
Anemia	17 (39.5)	14 (43.7)	0.23
Thrombocyto- penia	15 (34.8)	12 (37.5)	0.23
Jaundice	3 (6.3)	3 (9.3)	0.64
Raised ALT	6 (13.9)	4 (12.5)	0.47
Renal failure	1 (2.1)	1 (3.1)	0.40
ARDS	2 (4.2)	1 (3.1)	0.42
Cerebral malaria	2 (4.2)	2 (6.2)	0.35

DISCUSSION

According to WHO report 2010, out of all malaria cases in South East Asia region more than 50% cases are of vivax[1]. Vivax malaria was always described as a benign disease. However in the past few years many cases of severe vivax malaria were seen and some cases resulted in death. And the status of *P. vivax* as a major threat affecting the world's most populous region is gaining attention. The belief that *vivax malaria* is rarely threatening and relatively benign is increasingly being challenged. Hence this study was done to compare the clinical profiles and complications of both the types of malaria i.e. P. vivax and P. falciparum in chil- dren. In this retrospective observational study we report 75 patients with *P. vivax* and *P. falciparum* malaria. Clinical profile and complication of *P. vivax* were similar to those caused by *P. falciparum* malaria which included anaemia, splenomegaly, thrombocytopenia, raised alanine aminotransferase (ALT), jaundice, renal failure, ARDS, and cerebral malaria. These findings of similar complication of *P. vivax* malaria were also reported by other authors.[4-5]Thrombocytopenia is a well known complication of *P. fal- ciparum* malaria but also encountered in *P. vivax* malaria. This may be due to multiple factors which include increase in platelet destruction by platelet associated IgG antibody and its consumption. We observed thrombocytopenia in 34.8% in *P. vivax group* and 37.5 in *P. falciparum group* malarial children. Other authors from India also reported significantly higher proportion of thrombocytopenia in *P. vivax*. Raised ALT and jaundice were present in 13.9% and 6.3% cases of *P. vivax* while the same were present in 12.5% and 9.3% cases of *P. falciparum*. Hepatic involve- ment has been well documented in *P. falciparum* malaria but also reported in *P. vivax* malaria. The possible expla- nation for hepatic involvement is direct injury to liver by parasite leading to malarial hepatitis. Renal failure was en- countered in 2.1%and 3.1% of *P. vivax* and *P. falciparum* cases in the present study, respectively. Renal failure was observed commonly in *P. falciparum* but also has been re- ported in *P. vivax* malaria. Renal failure in malaria is caused by parasitized red blood cells leading to mechanical ob- struction. Microcirculatory disorders, disseminated intra- vascular coagulation, fluid loss, and hypoxic or immune-mediated necrosis of renal tubules and glomeruli are the possible mechanisms that may be implicated in *vivax* infec- tion. Acute respiratory distress syndrome (ARDS) has been encountered in 3-4% cases of *P. vivax* and *P. falciparum* malaria. It is known to occur in *P. falciparum* malaria due to sequestration but not reported in *P. vivax* malaria very often. In our present study one patient of *P. vivax* died due to ARDS. The recent studies have shown that sequestra- tion, cytokines, and nitric oxide production are mainly re- sponsible for this complication of *P. vivax* malaria. Cerebral malaria has been observed in 4.2% of P. vivax and 6.2% of P. falciparum cases in our study. Cerebral malaria is a very severe complication and leading to one of the most common causes of mortality of malaria. One of our infect- ed patients of *P. falciparum* malaria died due to cerebral malaria. Though exact pathogenesis of cerebral malaria in *P. vivax* remains unknown, few studies suggested that it might be due to sequestration and cytokine mediated cer- ebral injuries. We believe that *P. vivax* malaria infection is often underestimated though complications and mortality are almost similar in *comparison* to *P. falciparum* malaria. Further large scale studies are required to know the exact pathogenesis of complications of *P. vivax* malaria. There is an urgent need of public health measures to estimate the burden of *P. vivax* malaria so that adequate planning and control measures can be taken against this emerging prob- lem.

Limitations:

The major limiting factor of our study was its retrospective nature and the small sample size.

CONCLUSION

The study shows vivax as an important cause of morbidity and mortality from malaria among children. The present study shows vivax as quite an important cause of severe malaria. In fact a comparison of severe malaria cases shows no significant difference in severity vivax and falciparum.

Therefore present study concludes that ***P. vivax* mono in- fection tends to have as severe course and complica- tions as compared to malaria due to *P. falciparum* mono infection in children.**

REFERENCES

1. Estimation of True Malaria burden. World Health Re- port, Geneva, *World Health Organization.* 2008.
2. Severe *falciparum malaria*. World Health Organization, Communicable Diseases Cluster. *Trans R Soc Trop Med Hyg.* 2000; 94:S1-90.
3. Limaye CS, Londhey VA, Nabar ST. The study of complications of *vivax malaria* in comparison with *falciparum malaria* in Mumbai. *Journal of the Association of Physicians of India.* October 2012; Vol 60: 15-18.
4. Nadkar MY, Huche AM, Singh Raminder, Pazare AR. Clinical profile of severe *Plasmodium vivax malaria* in a tertiary care centre in Mumbai from June 2010-Jan 2011. *Journal of the Associations of physicians of India.* October 2012; Vol 6: 11-13.
5. D. K. Kochar, A. Das, S. K. Kochar et al., "Severe *Plasmodium vivax* ma- laria: a report on serial cases from Bikaner in northwestern India,"*The American Journal of Tropical Medicine and Hygiene*, vol. 80, no. 2, pp. 194 198, 2009.
6. WHO, *Guidelines for the Treatment of Malaria*, WHO, 2nd edition, 2010.
7. World Health Organization, *Good Practices for Selecting and Procuring Rapid Diagnostic Tests for Malaria*, World Health Organization, Geneva, Switzerland, 2011.
8. Kochar D, Saxena V, Singh N, Kochar S, Kumar V, Das A. *Plasmodium vivax malaria. Emerg Infect Dis.* 2005; 11:132-34.
9. B. Genton,V.D'Acremont, L. Rare et al., "*Plasmodiumvivax* and mixed infections are associated with severe malaria in children: a prospective cohort study from Papua New Guinea," *PLoS Medicine*, vol. 5, no. 6,Ar- ticle ID e127, 2008.
10. Jat KR, Guglani V, Khairwa Anju. Severe and complicated *Plasmodium vivax malaria* in children. *Trop Doct.* Oct 2012; 42: 185-87.
11. C. S. Scott, D. van Zyl, E. Ho, L. Ruivo, B. Mendelow, and T. L. Coetzer, "Thrombocytopenia in patients with malaria: automated analysis of opti- cal platelet counts and platelet clumps with the Cell Dyn CD4000 ana- lyser," *Clinical & Laboratory Haematology*, vol. 24, no. 5, pp. 295–302, 2002.
12. K. Saravu,M. Docherla, A. Vasudev, and B. A. Shastry, "Thrombocytope- nia in vivax and falciparum malaria: an observational study of 131 pa- tients in Karnataka, India," *Annals of Tropical Medicine & Parasitology*, vol. 105, no. 8, pp. 593–598, 2011.
13. G. S. Tanwar, P. C. Khatri, C. K. Chahar et al., "Thrombocytopenia in childhood malaria with special reference to *P. vivax* monoinfection: a study from Bikaner (Northwestern India)," *Platelets*, vol. 23, no. 3, pp. 211–216, 2012.
14. D. K. Kochar, P. Singh, P. Agarwal, S. K. Kochar, R. Pokharna, and P. K. Sareen, "Malarial hepatitis," *Journal of Association of Physicians of In- dia*, vol. 51, pp. 1069–1072, 2003.
15. C. Anand, C. Ramji, A. S. Narula, and W. Singh, "Malarial hepatitis: a heterogeneous syndrome?" *National Medical Journal of India*, vol. 5, no. 2, pp. 59–62, 1992.
16. S.Srivastava, S. Ahmad,N. Shirazi, S. KumarVerma, andP. Puri, "Retro- spective analysis of vivax malaria patients presenting to tertiary referral centre of Uttarakhand," *Acta Tropica*, vol. 117, no. 2, pp. 82–85, 2011.
17. Douglas NM, Anstey NM, Buffet PA, Poespoprodjo JR, Yeo TW, White NJ, *et al*. The anaemia of *Plasmodium vivax* malaria.*Malar J* 2012; *11:* 135.
18. R. Premaratna, A. K. E. Gunatilake, N. R. de Silva, Y. Tilakaratne, M. M. D. Fonseka, and H. J. de Silva, "Severe hepatic dysfunction associated with falciparum malaria," *Southeast Asian Journal of TropicalMedicine and PublicHealth*, vol. 32,no. 1, pp. 70–72, 2001.
19. Patwari, S. Aneja, A. M. Berry, and S. Ghosh, "Hepatic dysfunction in childhood malaria," *Archives of Disease in Childhood*, vol. 54, no. 2, pp. 139–141, 1979.
20. R. Singh, S. Kumar, S. K. Rana, B. Thakur, and S. P. Singh, "A compara- tive study of clinical profiles of vivax and falciparum malaria in children at a tertiary care centre in Uttarakhand," *Journal of Clinical and Diag- nostic Research*, vol. 7, no. 10, pp. 2234–2237, 2013.