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Original Research Article

To know morbidity and mortality pattern in malaria of Plasmodium vivax (Pv) and Plasmodium falciparum (Pf) malaria in paediatric patients

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Abstract

Background & Methods: The aim of the study is to know morbidity and mortality pattern in malaria of Plasmodium vivax (Pv) and Plasmodium falciparum (Pf) malaria in paediatric patients.

Results: In our study we found, Mortality rate for Pf 5.7%, Pv 2.9%, Pf+ Pv 5%

Conclusion: Mortality rate of malaria was found to be 4.7%. Pf was associated with higher mortality rate as compared to Pv. Complications were more common with Pf group, though they were also seen in Pv group. Percentage of severe malaria attributable to vivax was 20.6% in our study. The conclusions of our study viz., various clinical presentations & lab profile of malaria, morbidity & mortality patterns in malaria and prognostic factors can be extrapolated to peripheral health workers.

Keywords: morbidity, mortality, malaria, Plasmodium vivax and Plasmodium falciparum.

Study Design: Observational Study

1. Introduction

Malaria caused by Plasmodium vivax seriously challenges human health, attacking 100 to 400 million people each year among the 2.5 billion living at endemic risk. The other important cause of malaria, Plasmodium falciparum, involves essentially similar global burden estimates[1]. The three other species causing human malaria—Plasmodium malariae, Plasmodium ovale, and Plasmodium knowlesi (a zoonosis) are much less common. The geographic distributions of the two numerically dominant species are largely sympatric, with two important exceptions: (i) endemic P. vivax occurs with an extremely low prevalence throughout much of the continent of Africa, as a consequence of human genetic negativity for Duffy factor surface molecules required for invasion of red blood cells (RBC); and (ii) P. vivax occurs at subtropical and temperate latitudes that are inhospitable to P. falciparum, such as the Korean Peninsula, China, and southwestern Asia[2]. The center of weight of the burden of P. falciparum is Africa, whereas that for P. vivax is Asia, especially South and Southeast Asia. Although relatively few people live at risk in the Americas, endemic transmission dominated by P. vivax is widespread throughout Central and South America[3].

Despite the availability of evidence suggesting otherwise, contemporary media, expert reports, and technical articles published in peer-reviewed journals often express statements much like these: “More than 90% of world's malaria burden is in Africa having more than 90% of this burden. The July 2007 National Geographic carried on its cover a dramatic

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portrait of a mosquito and the bold title “Malaria: Stopping a Global Killer”. That otherwise superb article failed to mention P. vivax, but in so doing it faithfully represented the dominant expert opinion that P. vivax is clinically benign and its burden a relatively unimportant piece of the global malaria problem[4]. Indeed, an audit of investments in malaria research and development showed that P. vivax accounted for 3.1% of global spending during 2007 to 2009. The problem extends beyond research and development: a historic initiative launched in 2005 by the U.S. government, the President's Malaria Initiative, strictly limited assistance to nations on the continent of Africa. Snow and colleagues quantified inequities in international donor assistance for the malarious nations in Asia, concluding that “countries where P. vivax continues to pose threats to control ambitions are not as well funded.” Piggot et al. estimated that per capita spending for malaria control by population at risk in Central and Southeast Asia[5]. The perception of P. falciparum, and therefore Africa, as dominating the global malaria burden carries very significant consequences with respect to the response of humanity to that problem[6].

2. Material and Methods

Present study was conducted at Indira Gandhi District Hospital, Mandsaur for 01 year, A total of 230 confirmed cases of malaria were taken up for the study from the admitted patients of which 141 were falciparum positive, 69 were vivax positive & 20 patients were positive for both Pf & Pv**.**

Inclusion criteria:

1. Presence of malarial parasite on thick and thin peripheral smear and/or positive rapid malaria antigen test (rapid immono-chromatogenic test) was considered as diagnostic for malaria.
2. RDT was performed according to the manufacturer’s instructions. Categorization into severe malaria and their treatment was as per WHO guidelines. Admission laboratory values were used for patient classification and data analysis.

Exclusion criteria:

1. All patients were investigated for other co-existent infections including enteric fever, dengue and hepatitis, whenever deemed relevant. Patients having another infection with plasmodium such as enteric fever and hepatitis were excluded.

3. Result

Table 1: Age and sex distribution in plasmodium species

Age	**<5 Years**		**5-10 Years**		**>10 Years**	
Sex / **Species**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Pf	35 (24.8%)	33 (23.4%)	26 (18.4%)	22 (15.6%)	15 (10.6%)	10 (7%)
Total	**48.2%**		**34 %**		**17.6%**	
Pv	24 (34.7%)	21 (30.4%)	12 (17.3%)	4 (5.7%)	6 (8.6%)	2 (1.4%)
Total	**65.1%**		**23%**		**10%**	
Mix	5 (25%)	4 (20%)	4 (20%)	4 (20%)	2 (10%)	1 (5%)
Total	**45%**		**40%**		**25%**	

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Table 2: Comparison of hematological parameters in Plasmodium falciparum and Plasmodium vivax malaria

Hematological Parametes	P. falciparum (141)		P.vivax (69)		P value
	Mean	SD	Mean	SD	
Hb	6.97	2.58	7.41	2.34	0.001
TLC	10,409	7,063	8,892	6769	0.067
Platelet	1,47,992	1,42,613	1,64,835	1,52,295	0.406

P value < 0.001 highly significant; < 0.05 significant; > 0.05 not significant

Table 3: Mortality Pattern of Malaria

Pf = 8 (5.7%)	**Pv = 2 (2.9%)**	**Pf+ Pv = 1 (5%)**
Cerebral Malaria = 05	Jaundice = 01	Cerebral Malaria = 01
ARF = 01	ARF =01	
Shock = 01		
MODS = 01		

In our study we found, Mortality rate for Pf 5.7%, Pv 2.9%, Pf+ Pv 5%

4. Discussion

Percentage of severe malaria attributable to vivax was 20.6% in our study. Severe malaria is classically associated with Pf infection but sporadically, all complications associated with Pf malaria have also been reported in Pv malaria. Price RN et al[7] in his recent study, has shown that 21–27% of patients with severe malaria have Pv mono-infection and clinical spectrum of these cases is broad with an overall mortality of 0.8–1.6% . Similar high proportion of severe Pv malaria has been reported in studies in children by Yadav D et al [8]. Our results are consistent with them.

Mix infections behaved like falciparum in respect to clinical features & complications in our study. Earlier studies of Luxemburger C, Ricci F, Nosten F et al[9] in Thailand in last decade suggested a protective effect of Pv and suggested that Pv co-infection with Pf may attenuate severity of Pf malaria. However, recent studies from Tjitra E, Anstey NM et al[10] from Papua New Guinea have reported that mixed infections have features comparable to falciparum.

There was no significant difference in symptomatology of vivax and falciparum except the presence of loss of consciousness and seizure which were seen with falciparum patients (with the exception of one case of vivax). Chills & rigor was most common symptom associated with both vivax & falciparum cases. Nausea & vomiting, pain in abdomen, headache, diarrhoea & cough were the next complaints in decreasing order. Vomiting was observed in 43.3% of the patients in the study conducted by Mehta et al and it was seen in 34.7% of the patients of our study.

Pallor was most common physical sign which was predominantly seen in falciparum cases. Spleenomegaly was 2nd common sign followed by icterus. Both had nearly equal distribution in vivax & falciparum cases. Spleenomegaly was present in 49.6% & 50.7% of pf & pv cases respectively. Hazra et al had reported splenomegaly in 18.18% of PV and 40% of PF cases. Malhotra et al reported splenomegaly in 31.25% & Murthy et al in 50% of malaria cases[11].

Encephalopathy, shock, MODS & renal failure at the time of presentation were poor prognostic factors, while anaemia & thrombocytopenia were not found to be associated with

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adverse outcome. Nature of thrombocytopenia in malaria is benign, mostly recovering with antimalarials without platelet transfusions. In our study, mortality rate of malaria was found to be 4.7%. Pf was associated with higher mortality rate as compared to Pv. Complications were more common with Pf group, though they were also seen in Pv group.

5. Conclusion

Mortality rate of malaria was found to be 4.7%. Pf was associated with higher mortality rate as compared to Pv. Complications were more common with Pf group, though they were also seen in Pv group. Percentage of severe malaria attributable to vivax was 20.6% in our study. The conclusions of our study viz., various clinical presentations & lab profile of malaria, morbidity & mortality patterns in malaria and prognostic factors can be extrapolated to peripheral health workers.

6. References

1. Kute VB, Trivedi HL, Vanikar AV, Shah PR, Gumber MR, Patel HV, Goswami JG, Kanodia KV. 2012. Plasmodium vivax malaria-associated acute kidney injury, India, 2010–2011. Emerg. Infect. Dis. 18:842– 845.
2. Lacerda MV, Fragoso SC, Alecrim MG, Alexandre MA, Magalhaes BM, Siquiera AM, Ferreira LC, Aroujo JR, Mourao MP, Ferrer M, Castillo P, Martin-Jaular L, Fernandez-Becerra C, del Portillo H, Ordi J, Alonso PL, Bassat Q. 2012. Postmortem characterization of patients with clinical diagnosis of Plasmodium vivax malaria: to what extent does this parasite kill? Clin. Infect. Dis. 55:e67– e74.
3. Oh MD, Shin H, Shin D, Kim U, Lee S, Kim N, Choi MH, Chai JY, Choe K. 2001. Clinical features of vivax malaria. Am. J. Trop. Med. Hyg. 65:143–146.
4. Koh KH, Chew PH, Kiyu A. 2004. A retrospective study of malaria infections in an intensive care unit of a general hospital in Malaysia. Singapore Med. J. 45:28 –36.
5. Barcus MJ, Basri H, Picarima H, Manyakori C, Sekartuti Elyazar I, Bangs MJ, Maguire JD, Baird JK. 2007. Demographic risk factors for severe and fatal vivax and falciparum malaria among hospital admissions in northeastern Indonesian Papua. Am. J. Trop. Med. Hyg. 77:984 –991.
6. Beg MA, Sani N, Mehraj V, Jafri W, Khan MA, Malik A, Menezes E, Hussain R, Smego R, Jr. 2008. Comparative features and outcomes of malaria at a tertiary care hospital in Karachi, Pakistan. Int. J. Infect. Dis. 12:37– 42.
7. Price RN, Douglas NM, Anstey NM. New developments in Pv malaria: severe disease and chloroquin resistance. Curr Opin Infect Dis. 2009;22:430–5.
8. Yadav D, Chandra J, Dutta AK, Aneja S, Kumar V, Kumar P. Indian J Pediatr (April 2012) 79(4):483–487 DOI 10.1007/s12098-011-0603-x. Changing Profile of Severe Malaria in North Indian Children.
9. Luxemburger C, Ricci F, Nosten F et al. The epidemiology of severe malaria in an area of low transmission in Thailand. Trans R Soc Trop Med Hyg. 1997;91:256–62.
10. Tjitra E, Anstey NM, Sugiarto P et al. Multidrug-resistant Pv malaria associated with high morbidity and mortality. PLoS Med. 2007; 5:e128. doi:10.1371/journal.pmed.0050128
11. Rodrıguez-Morales AJ, Sanchez E, Vargas M et al. Anemia and thrombocytopenia in children with plasmodium vivax malaria. J Trop Pediatr. 2005;52:49–51.