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CLINICAL FEATURES OF CEREBRAL MALARIA DUE TO PLASMODIUM VIVAX IN MEDICAL COLLEGE ASSOCIATED HOSPITAL IN TELANGANA STATE: AN OBSERVATIONAL STUDY SPREAD OVER A DECADE

Medicine

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ABSTRACT

Malaria is prevalent in all over the World. Plasmodium vivax accounts for more than half of all malaria cases in Asia. The present study was conducted in SVS Hospital, Mahabubnagar, a tertiary care teaching hospital. Total cases of 1219 proved malaria admitted to SVS Hospital. Of 954 severe malaria cases, there were 660 total cases of cerebral malaria(as per WHO criteria), 286 (43.33%) cases caused by P falciparum while 280 (42.42%) adults were affected by P vivax and another 94 (14.24%) due to mixed infection.severe headache, fever and bruxism were the most important clinical features in this study. Bruxism was observed in 90% or above cases in this study which was not reported by earlier studies as per the published data. Bruxism was earlier sporadic reports. The literature was extensively reviewed and compared.

KEYWORDS

Plasmodium vivax, Cerebral Malaria, Clinical features,

INTRODUCTION:

Malaria is prevalent in all over the World. Sixspecies of *Plasmodium* (*P. falciparum, P.vivax*, two subspecies of *P. ovale, P. malariae,* and *P. knowlesi*) are known to cause malaria [1]. Of these, *P.vivax* was responsible for 13.8 million cases of malaria in 2015, with most cases (76%) occurring in the Southeast Asia Region (SEAR) where India and Pakistan share the burden [2]. Plasmodium vivax accounts for more than half of all malaria cases in Asia. Severe forms of malaria were mainly caused by P. falciparum. There is paucity of clinical reporting in the research [3]. There is an increase in severe malaria across the World[4-8]. There have been cases of cerebral malaria caused by P vivax[9-13]. Present study was done to look in to the involvement of plasmodium vivax causing cerebral malaria.

MATERIALS AND METHODS:

The present study was conducted in SVS Hospital, Mahabubnagar, a tertiary care teaching hospital. This is a semi-urban hospital based clinical observational study. Cases of confirmed malaria patients admitted between January 2007 to December 2016 were collected in a preformed proforma. The study was approved by the Ethical committee of the institute. Both microscopy (thick and thin smears) and rapid diagnostic test were performed in all suspected cases of malaria. The rapid diagnostic test was conducted using one step malaria anti P.f/P.v.We further studied the clinical profile, treatment and outcome of these patients. Every case was screened for other similar diseases by appropriate tests like urine examination with culture and sensitivity, X-ray chest, ultrasonography, blood culture, C.S.F. examination other specific tests were done as and when needed. The patients with earlier neurological, psychiatric, traumatic brain injury [TBI], or any systemic illness were excluded from this study. All the patients were treated according to W.H.O. guidelines. Data was collected in a preformed proforma and analysed by SPSS 20.0 software. Values are expressed in number and percentage (%).

OBSERVATIONS AND RESULTS:

Total cases of 1219 proved malaria admitted to SVS Hospital. Of 954 severe malaria cases, there were 660 cases of cerebral malaria (as per WHO criteria) 280 cases were due to falciparum infection, 286 were due to vivax infection and remaining 94 were that of mixed infection.

Table 1: Total cases of Malaria with respect to species encountered in SVS Hospital during study period of 10 years (1-1-2007 to 31-12-2016).

	Total number	Number of severe cases
Total number of positive Malaria cases	1219	954
Plasmodium vivax cases	540	380
Plasmodium falciparum cases	402	468
Mixed infection	277	106

Table 2: Various species causing Cerebral Malaria

	Number of severe cases	Cerebral malaria cases
Total number of Malaria cases	954	660
Plasmodium vivax cases	380	280
Plasmodium falciparum cases	468	286
Mixed infection	106	94

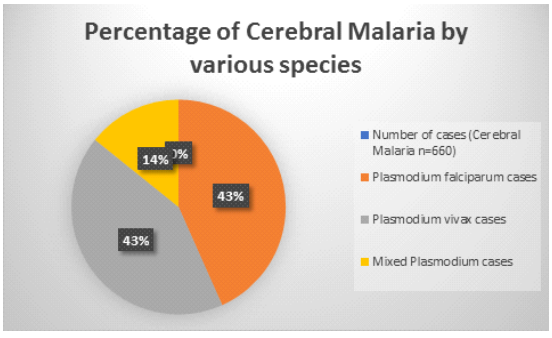


Table 3: Age and Gender differences among the cases ofCerebral Malaria

	P. falciparum	P. vivax	Mixed	Total
Age mean (years) with standard deviation	17.12 ± 8.56	19.48 ± 7.98	32.32 ± 6.12	20.02 ± 8.02
Male (number)	44	50	24	118
Female (number)	36	36	20	92

Table 4: Clinical features of our cases of Cerebral Malaria

Presentation	Number of cases(Cerebral Malarian=660)	Plasmodium falciparum cases 286	Plasmodium vivax cases 280	Mixed Plasmodium cases 94
Severe Headache	660 (100%)	286 (100.00%)	280 (100%)	94 (100%)
Bruxism (Teeth grinding)	558 (84.54)	260 (90.9%)	220 (78.57%)	78 (82.97%)
Extensor plantar response	482 (73.03)	264 (94.28%)	180 (64.28%)	38 (40.42%)
Rigidity/ Hypertonia	398 (60.30%)	260 (90.90%)	100 (35.71%)	38 (40.42%)
Decerebrate /Decorticate rigidity	316 (47.88%)	214 (74.82%)	32 32 (11.42%)	74 (78.72%)
Status Epilepticus	128 (19.39%)	120 (41.92%)	3 (01.07%)	5 (05.32%)
Speech abnormalities	120 (18.18%)	78 (27.27%)	22 (07.86%)	20 (21.28%)
Cranial nerve Palsy	76 (11.51%)	74 (25. 87%)	2 (0.71%)	-
Conjugate deviation of eyes	70 (10.60%)	60 (20.97%)	8 (02.86%)	2 (02.13%)
Psychiatric manifestations	47 (07.12%)	7 (02.44%)	38 (13.57%)	2 (02.13%)
Quadriparesis	24 (03.64%)	20 (06.98%)	2 (0.71%)	2 (02.13%)
Cerebellar signs/Ataxia	18 (02.73%)	8 (2.79%)	18 (06.42%)	-
Myoclonic jerks	9 (01.36%)	8 (2.79%)	1 (0.35%)	-

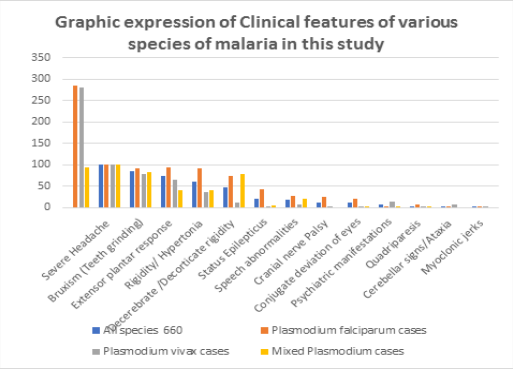
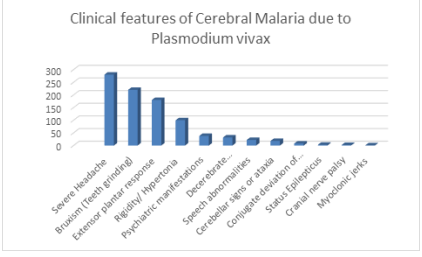


Table 4: Clinical features of Cerebral Malaria due to Plasmodium vivax

Presentation	Plasmodium vivax cases
Severe Headache	280
Bruxism (Teeth grinding)	220
Extensor plantar response	180
Rigidity/ Hypertonia	100
Psychiatric manifestations	38
Decerebrate /Decorticate rigidity	32
Speech abnormalities	22
Cerebellar signs or ataxia	18
Conjugate deviation of eyes	8
Status Epilepticus	3
Cranial nerve palsy	2
Myoclonic jerks	1



DISCUSSION:

1.4 billion people at risk for malaria in 2015; while 237 million were at high risk[14]. Estimated malaria case incidence decreased by 54% between 2010 and 2015. Estimated malaria mortality rate reduced by 46% between 2010 and 2015. India shared 89% of all SEAR (South East Asian Region). Plasmodium vivax threatens almost 40% of the world's population, resulting in 132 - 391 million clinical infections each year. Most of these cases originate from South East Asia and the Western Pacific, although a significant number also occur in Africa and South America. Although oftenregarded as causing a benign and self-limiting infection, there is increasing evidence that theoverall burden, economic impact and severity of disease from P. vivax have been underestimated. Recent data suggests the burden of disease may be increasing. Official number of cases for 2009 in India was 1.6 million with 10,000 deaths. These figures have been challenged and deaths between 125000 – 277000 based on verbal autopsy reports have been suggested[15].

The present study spread over a decade. The stress mainly done on clinical presentation of cerebral malaria.There were 660 total cases of cerebral malaria(as per WHO criteria), 286 (43.33%) cases caused by P falciparum while 280 (42.42%) adults were affected by P vivax and another 94 (14.24%) due to mixed infection.

Review of literature with the present study - I

Study	Place of study	Number of cases	Presentation
Tarejevet al [18]	Russia 1944	12 [4-17 years]	Seizures and decreased consciousness
Roder and Vietze [19]	Africa 1967	1 [18 years]	Decreased consciousness
Verma and Magotra[20]	Jammu, India 1976	3 (3.5, 7, 9 years)	Coma, seizure, delirium
Sachdev and Man [21]	New Delhi, India 1985	6 (4–12 years)	Coma (4/6 cases), seizures (5/6), hemiparesis (1/6)
Ahmad, Moonis, Kidwai et al [22]	Aligarh, India 1986	4 (children)	Cerebral malaria
Valecha, Bagga, Chandra et al [23]	India 1992	2 (2, 3 years)	Coma, seizures
Kochar DK, Saxena V and Singh N et al 2005 [7]	Bikaner, Rajasthan, India	3 adult cases out of 11 P vivax malaria cases were cerebral malaria	One case died during course.
Ozen, Gungor, Atamby, and Daldal [24]	Malatya, Turkey, 2006	1 (4 years)	Cerebral malaria (status epilepticus)
Thapa, Patra and Kundu [25]	Kolkata, India, 2007	2 (12 years)	Cerebral malaria
Kumar et al [26]	Agra, India 2007	81 children cerebral malaria was seen in 18.51%	Severe anemia was more common due to P falciparum while cerebral malaria was due to P vivax in children below 15 years of age
Taksande and Vilhekar. [27]	Maharashtra, India 2008	1 (10 years)	Cerebellar dysfunction with intact sensorium
Tjitra, Anstey, Sugiarto et al. [28]	Papua, Indonesia, 2008	16 children	Impaired consciousness
Genton B, Acremont VD, Rare L, et al. [29]	Papua, New Guinea 2008	22 (children)	Seizures & decreased Consciousness

Sarcar and Bhattacharya 2008 [30]	India 2008	3 adults	Cerebral malaria due to P vivax
Harish and Gupta [31] 2009	Jammu, India 2009	2 (1, 4 years)	Cerebral malaria, hydrocephalus, severe thrombocytopenia
Thapa, Ranjan, Patra and Chakrabartty2009 [32]	Kolkata, India 2009	1 (7 years)	Cerebral malaria with pancytopenia
Parakh, Agarwal, Aggarwal and Aneja 2009 [33]	Delhi, India 2009	3 (1.5 – 11 years)	Cerebral malaria

Review of literature with the present study - II

Study	Place of study	Number of cases	Presentation
Kochar, Saxena, Singh et al 2010 [34]	Bikaner, India 2010	9 adult cases	Cerebral malaria
Lampah et al 2011 [35]	Papua, Indonesia	PCR demonstrated 10 mixed infections and 3 P. falciparum mono-infections. 6 (25%) patients had vivax mono-infection and no apparent alternative cause	6 cases of cerebral malaria due to P vivax
Tanwar GS et al 2011 [36]	Bikaner, India	13 Children	Cerebral malaria
Deshwal R 2011 [37]	Gangtok, Sikkim	One adult	Cerebral malaria
Nadkar et al 2012 [38]	Maharashtra India	24 adults	Cerebral malaria due to P vivax
Charulata S Limaye et al [39]	2012 Maharashtra	Adults 162 total cases	40 cerebral malaria due to P vivax
Singh et al [40]	2013 Chandigarh and Gujarat	110 Adults	19 (17.2%) were cases of severe malaria while there were 3 patients had cerebral malaria by P vivax
S SKarnath et al 2014 [41]	Manipal, India	1 adult	Intracerebral bleed
Rajesh Kumar et al, 2014 [42]	2014 Agra	81 Children 27 P vivax, 26 P falciparum and 4 mixed infection	5 cerebral malaria P vivax cases 3 P falciparum and mixed infections
R Bhatia and G Bhatia, 2014 [43]	Udaipur, India	One 9 year old boy	Cerebral malaria
Saravu et al 2014 [44]	2014 Manipal, India	922 malaria; 24 cerebral malaria	20 cases of cerebral malaria were due to P falciparum, 4 were proved fatal
Thomas R, Alexander A, Paul A, Philip S, Rajeev I (2015) [45]	Cochin, India 2015	57 year old male business man with fever and failure of multiple organs	Cerebral malaria as a part of multiorgan failure
Gupta et al 2016 [46]	New Delhi, 2016		12 and 14 year old girls with cerebral malaria
Shashank et al 2017 [47]	Ranchi, Jharkand, India	110 Children – 35 cerebral malaria,	8 were due to P vivax
Kochar SK et al 2017 [48]	Bikaner India	16 years old boy	Cerebral infarct in 16 years old
Im et al 2017 [49]	Incheon, South Korea	210 cases – 88 admitted	Cerebral malaria (5/210, 2.4%),
Present study	Mahabubnagar, Telangana India	1219 proved malaria admitted to SVS Hospital. there were 660 cases of cerebral malaria (as per WHO criteria).	280 cases were due to falciparum infection [22.97% of total cases, 42.42% of cerebral malaria], 286 [23.46% of total malaria, 43.33% of cerebral malaria cases] were due to vivax infection and remaining 94 [7.71% of total malaria patients while 14.24% of cerebral malaria cases] were that of mixed infection.

Bruxism was observed in 90% or above cases in this study which was not reported by earlier studies as per the published data. Bruxism was earlier sporadic reports[50,51].

As against our study Sharma and Khanduri[52] reporting from St Stephen's Hospital 2005 to 2006 didn't find a single case of cerebral malaria out of 265 confirmed cases by peripheral blood examination. Of these 221 were due to *Plasmodium vivax* and 41 due to *P. falciparum*. Two cases had mixed infection and in one case the species could not be identified as it showed only malarial pigment.

Limitations:

This was a prospective observational study without comparing control group, which was the main limitation of this study.

NV designed the study and PR and MS were involved in the management of the patient. TN reviewed the literature and MG was involved in the final draft of the manuscript. NV will act as the guarantor. Authors thank the Medical Director Dr KJ Reddy and Dean Dr BA Rama Rao for all the institutional support. Authors have no financial interests to declare.

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