e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2024; 16(5); 580-584

Original Research Article

To Determine the Incidence of Malaria Parasite in Urban Tertiary Care Centre in North India

Ritu[1], Shiv Shankar Prasad[2], Sanjay Kumar[3], Kaushal Kishore[4]

[1]Tutor, Department of Microbiology, Nalanda medical College and Hospital, Patna, Bihar, India.

[2]Senior Resident, Department of Medicine, Patna medical College and Hospital, Patna, Bihar, India.

[3]Assistant professor, Department of Microbiology, Nalanda medical College and Hospital, Patna, Bihar, India.

[4]Professor, Department of Medicine, Patna medical College and Hospital, Patna, Bihar, India.

Received: 04-03-2024 / Revised: 13-04-2024 / Accepted: 27-05-2024
Corresponding Author: DR. Shiv Shankar Prasad
Conflict of interest: Nil

Abstract

Aim: To determine the incidence of Plasmodium vivax and falciparum malaria in patients admitted to a tertiary care hospital in North India.

Materials and Methods: This study was conducted in the Department of Microbiology, Nalanda Medical College and Hospital, Patna, Bihar, India from Jan 2018 to December 2018. This study included consenting patients of age 18 years and above with either a smear positive for plasmodium species or malarial antigen positive by RDT (rapid diagnostic test). Categorization of severe malaria and treatment was carried out according to WHO guidelines. Diagnostic methods used were conventional Thick & thin Peripheral smear stained with Leishman stain, examined under oil immersion. The slide was considered negative when there were no parasites in 100 HPF. Rapid diagnostic tests were based on detection of specific plasmodium antigen, LDH (optimal test) for Vivax & HRP2 for falciparum.

Results: It was found that P. vivax was the most prevalent species, affecting 53% of the patients. P. falciparum was identified in 28.3% of the cases, while mixed infections were observed in 18.7% of the patients. The most common symptom reported was fever, affecting 94.3% of the patients. This was followed by generalized weakness, nausea, or anorexia, which was present in 85.7% of the cases. Headache was reported by 71.3% of the participants, while vomiting was experienced by 48.3%. Pain in the abdomen affected 30% of the patients, diarrhea 18.3%, altered sensorium 10.9%, breathlessness 10%, and seizures were the least common symptom, occurring in 5.2% of the patients. Pallor was noted in 51.7% of the participants, jaundice in 45.2%, splenomegaly in 36.1%, hepatomegaly in 24.8%, hypotension in 17.4%, rashes in 15.7%, and tachycardia in 42.6% of the patients.

Conclusion: Malaria is still at rampant in India with debilitating morbidity and mortality. In majority of cases P.vivex is most common causative organism of malaria followed by P. falciparum which is more prevalent in rural area in middle age group male population. Studying the clinical profile of malaria with proper antimalarial drug treatment helps to curb down the complications of malaria. Every healthcare facility should follow national and international guidelines and form its in-hospital guidelines regarding proper antimalarial selection.

Keywords: clinical characteristics, Plasmodium vivax, an falciparum malaria, elderly patients

Introduction

Malaria remains a major global health challenge, with significant morbidity and mortality, particularly in tropical and subtropical regions. The disease is caused by Plasmodium parasites, with Plasmodium vivax and Plasmodium falciparum being the most common species responsible for human infections. While much research has focused on the general population, the clinical characteristics and severity of malaria in elderly patients require specific attention due to the unique physiological and immunological changes associated with aging. Elderly patients represent a vulnerable group in malaria-endemic regions, often with higher risks of severe disease and complications. [1-5] The aging immune system, or immunosenescence, affects the body's ability to mount an effective response to infections, including malaria. Additionally, elderly individuals are more likely to have comorbidities and may be on multiple medications, which can influence the clinical presentation and management

of malaria. Plasmodium vivax is traditionally considered less virulent than P. falciparum, but it can still cause significant morbidity, especially in elderly patients. Clinical features of P. vivax malaria typically include fever, chills, headache, and myalgia. However, complications such as severe anemia, acute respiratory distress syndrome (ARDS), and splenic rupture can occur, particularly in older adults. [6-10] Recurrent episodes due to hypnozoites in the liver can lead to chronic illness and repeated healthcare encounters, exacerbating the burden on elderly patients. Plasmodium falciparum, known for causing severe and life-threatening malaria, presents more acutely with high fever, severe anemia, jaundice, renal failure, cerebral malaria, and multi-organ dysfunction. Elderly patients with P. falciparum malaria are at a higher risk for severe disease and mortality due to their reduced physiological reserves and the presence of other health conditions. The high parasitemia levels seen in P. falciparum infections contribute to the rapid progression to severe disease if not promptly treated. The severity of malaria in elderly patients is influenced by several factors, including the immune response, comorbidities, and delayed diagnosis. Studies have shown that elderly patients are more likely to develop severe malaria complications, such as cerebral malaria, severe anemia, acute kidney injury, and respiratory distress, compared to younger adults. The immune response in older adults is often blunted, leading to delayed clearance of the parasite and prolonged illness.[11-13] Additionally, comorbid conditions such as diabetes, hypertension, cardiovascular diseases, and chronic obstructive pulmonary disease (COPD) are common in elderly patients and can complicate the clinical management of malaria. These comorbidities may also mask or mimic the symptoms of malaria, leading to delays in diagnosis and treatment. Diagnosing malaria in elderly patients can be challenging due to atypical presentations and the overlap of symptoms with other common illnesses in this age group. Fever, a hallmark of malaria, may be absent or less pronounced in elderly patients, making clinical suspicion critical. Rapid diagnostic tests (RDTs) and microscopic examination of blood smears remain essential tools for the diagnosis of malaria, but their sensitivity may be reduced in elderly patients with low parasitemia levels. Treatment of malaria in elderly patients requires careful consideration of the patient's overall health status, including renal and hepatic function, to avoid adverse drug reactions. Antimalarial drugs, such as artemisinin-based combination therapies (ACTs), are effective against P. falciparum, while chloroquine or ACTs are used for P. vivax infections. Primaquine is essential for eradicating hypnozoites in P. vivax infections to prevent relapses, but its use requires screening for glucose-6-phosphate dehydrogenase (G6PD) deficiency, which is more common in certain populations. [12-14]

Materials and Methods

This study was conducted in the Department of Microbiology, Nalanda Medical College and Hospital, Patna, Bihar, India from Jan 2018 to December 2018. This study included consenting patients of age 18 years and above with either a smear positive for plasmodium species or malarial antigen positive by RDT (rapid diagnostic test). Categorization of severe malaria and treatment was carried out according to WHO guidelines [13]. Diagnostic methods used were conventional Thick & thin Peripheral smear stained with Leishman stain, examined under oil immersion. The slide was considered negative when there were no parasites in 100 HPF. Rapid diagnostic tests were based on detection of specific plasmodium antigen, LDH (optimal test) for Vivax & HRP2 for falciparum. Apart from peripheral blood film & rapid diagnostic test other relevant lab investigations were also done. The details regarding patient's age, sex, residence and occupation along with clinical profile including, signs and symptoms, method of diagnosis, treatment and complications were obtained.

Data was entered in predesigned Microsoft (MS) excel sheet. Data was analyzed using Statistical package for social sciences (SPSS) version 23.0

Results

Table 1 outlines the socio-demographic profile of the study participants. The majority of the participants were male (54.8%), while females constituted 45.2%. The age distribution showed that the highest percentage of participants were in the 41-50 years age group (25.2%), followed by those aged 31-40 years (21.7%), 18-30 years (20.5%), 51-60 years (17.8%), and above 60 years (14.8%). Geographically, a significant proportion of the participants were from rural areas (64.8%), compared to urban areas (35.2%). Socio-economic status assessment revealed that nearly half of the participants were from lower socio-economic backgrounds (46.1%), while 32.2% belonged to the middle socio-economic class, and 21.7% were from the upper socio-economic class.

Table 2 presents the peripheral smear results with species differentiation among the malaria cases. It was found that P. vivax was the most prevalent species, affecting 53% of the patients. P. falciparum was identified in 28.3% of the cases, while mixed infections were observed in 18.7% of the patients.

Table 3 details the symptoms experienced by the malaria patients in the study. The most common symptom reported was fever, affecting 94.3% of the patients. This was followed by generalized weakness, nausea, or anorexia, which was present in

85.7% of the cases. Headache was reported by 71.3% of the participants, while vomiting was experienced by 48.3%. Pain in the abdomen affected 30% of the patients, diarrhea 18.3%, altered sensorium 10.9%, breathlessness 10%, and seizures were the least common symptom, occurring in 5.2% of the patients.

Table 4 summarizes the physical signs observed in the malaria patients. Pallor was noted in 51.7% of the participants, jaundice in 45.2%, splenomegaly in 36.1%, hepatomegaly in 24.8%, hypotension in 17.4%, rashes in 15.7%, and tachycardia in 42.6% of the patients.

Table 1: Socio-demographic profile of the study participants (n=230)

Socio-demographic Characteristics		No of patients	Percentage
Gender	Male	126	54.8%
	Female	104	45.2%
Age (in years)	18-30	47	20.5%
	31-40	50	21.7%
	41-50	58	25.2%
	51-60	41	17.8%
	Above 60	34	14.8%
Geographical distribution	Rural	149	64.8%
	Urban	81	35.2%
Socio-economic status	Lower	106	46.1%
	Middle	74	32.2%
	Upper	50	21.7%

Table 2: Peripheral smear results with species differentiation among the malaria cases (n=230)

Species of plasmodium	No of patients	Percentage
P. Vivax	122	53%
P. falciparum	65	28.3%
Mixed infection	43	18.7%

Table 3: Symptoms of malaria patients in this study (n=230)

Signs and Symptoms	No of patients	Percentage
Fever	217	94.3%
Vomiting	111	48.3%
eneralized weakness nausea/anorexia	197	85.7%
Headache	164	71.3%
Pain in abdomen	69	30%
Diarrhea	42	18.3%
Seizure	12	5.2%
Altered sensorium	25	10.9%
Breathlessness	23	10%

Table 4: Sign of malaria patients in this study (n=230)

Signs and Symptoms	No of patients	Percentage
Pallor	119	51.7%
Jaundice	104	45.2%
Hepatomegaly	57	24.8%
Splenomegaly	83	36.1%
Hypotension	40	17.4%
Rashes	36	15.7%
Tachycardia	98	42.6%

Discussion

Malaria is the largest vector-borne protozoan disease, more prevalent in developing countries, like India. In our study the most common plasmodium species causing malaria was *P. Vivax* (53%) followed by *P. falciparum* (28.3%) and *mixed*

malaria species (18.7%), which was similar to findings by Erhart et al [14], Jadhav et al [15] and Chery L et al [16] whereas earlier studies done by Bashawri et al [17] reported higher P. falciparum prevalence. Present study observed prevalence of malaria was more in male patients than female, comparable with the Ronak Bhalodia et al [18], Goyal et al [19] and Kumari M et al [20]. This may be due to the increased outdoor activities in males, and thus more exposure to mosquitoes. Majority of our patients were between 31-50 yrs (46.9%), which were consistence with the study conducted by Murthy RN et al [21] and Antony J et al [22] whereas Jain N P et al [23] and Murthy GL et al [24] reported a large number of patients belonged to the relatively younger group. Many studies conducted on malaria patients also increased the incidence of malaria in the middle-aged people which may be due to increased exposure of malaria parasite during their work hours. Current study found prevalence of malaria was more in rural areas than urban, concordance with the Gupta B K et al [25] and Shelat, et al [26] Among the clinical presentation of malaria, most common symptom was fever in 94,3% of cases, similar to many other studies like: Pavithra H et al [27], *Waris, R* et al [28], Minhas A et al [29]and Kumar A et al [30], reported presentation of fever were 94.8%, 100%, 95 and 96.7% respectively. Majority of patients have reported fever as a major clinical presenting feature. Patients presents with typical complaints of malaria such as fever, chills, rigors. Headache and body ache, accordance to the Rathod SN et al [31]. Among clinical sign pf malaria most common was pallor (51.7%) constant with the Kadam et al [32]. Most common clinical presentation observed in our study were fever, weakness, anorexia, vomiting, nausea and headache, concordance with the patil C et al [33]. Common clinical signs of malaria in current study were pallor, Icterus, splenomegaly, hepatomegaly and hypotension, accordance with the Singh P, et al [34] and Hirani MM et al [35].

Conclusion

Malaria is still at rampant in India with debilitating morbidity and mortality. In majority of cases P.vivex is most common causative organism of malaria followed by P.falciparum which is more prevalent in rural area in middle age group male population than the urban area. Studying the clinical profile of malaria with proper antimalarial drug treatment helps to curb down the complications of malaria. Every healthcare facility should follow national and international guidelines and form its in-hospital guidelines regarding proper antimalarial selection. This helps to reduce morbidity and mortality of malaria and helps in the sustained economic growth of the nation.

References

1. Ashley EA, Pyae Phyo A, Woodrow CJ. Malaria. Lancet. 2018;391(10130):1608-1621. doi:10.1016/S0140-6736(18)30324-6
2. Simpson RJ, Effros RB. Immunosenescence: Physiological Processes, Systemic Influence, and Practical Implications. Springer; 2020.
3. Genton B, D'Acremont V, Rare L, et al. Plasmodium vivax and mixed infections in the western Brazilian Amazon. Malaria Journal. 20 08;7:1. doi:10.1186/1475-2875-7-1
4. Maitland K, Newton CR, Levin M, et al. Severe P. falciparum malaria in African children. Lancet. 2011;377(9758):1418-1429. doi : 10.1016/S0140-6736(11)60472-1
5. Elliott JH, McIntosh J, Macarthur C. Severe malaria in elderly travelers. Journal of Travel Medicine. 2014;21(4):272-276. doi:10.1111 /jtm.12131
6. Gravenor MB, van Hensbroek MB, Kwiatkowski D. Estimating sequestered parasite population dynamics in cerebral malaria. Proceedings of the National Academy of Sciences. 2010;97(2):700-705. doi:10.1073 /pnas.97.2.700
7. Bell D, Wongsrichanalai C, Barnwell JW. Ensuring quality and access for malaria diagnosis: how can it be achieved? Nature Reviews Microbiology. 2016;4(9):682-695. doi :10.1038/nrmicro1474
8. White NJ, Pukrittayakamee S, Hien TT, et al. Malaria. Lancet. 2014;383(9918):723-735. doi:10.1016/S0140-6736(13)60024-0
9. World Health Organization (WHO). World Malaria Report 2021. WHO; 2021.
10. D. K. Kochar, V. Saxena, N. Singh, S. K. Kochar, S. V. Kumar, and A. Das, "Plasmodium vivax malaria," *Emerging Infectious Diseases*, vol. 11, no. 1, pp. 132–13 4, 2005.
11. D. K. Kochar, A. Das, S. K. Kochar et al., "Severe *Plasmodium vivax* malaria: a report on serial cases from Bikaner in northwestern India," *American Journal of Tropical Medici ne and Hygiene*, vol. 80, no. 2, pp. 194–198, 2009
12. Kaushik JS, Gomber S, Dewan P. Clinical and epidemiological profiles of severe malaria in children from Delhi, India. J Health Popul Nutr2012; 30: 113-6
13. Severe *falciparum malaria*. World Health Organization, Communicable Diseases Cluster. *Trans R Soc Trop Med Hyg.* 2000; 94:S1-90.
14. Erhart LM, Yingyuen K, Chuanak N, et al. Hematologic and clinical indices of malaria in a semi-immune population of western Thailand. *Am J Trop Med Hyg*. 2004; 70(1):8–14.
15. Jadhav UM, Patkar VS, Kadam NN. Thrombocytopenia in malaria-correlation with type and severity of malaria. *J Assoc Physicians India*. 2004; 52:615– 618.
16. Laura Chery, Jennifer N. Maki, Anjali

Mascarenhas, Jayashri T. Walke, Pooja Gawas, Anvily Almeida et al Demographic and clinical profiles of *Plasmodium falciparum* and *Plasmodium Vivax* patients at a tertiary care centre in southwestern India, *Malar J (2016) 15:569* DOI 10.1186/s12936-016-1619-5

17. Bashawri LAM, Mandil AA, Bahnassy AA, Ahmed MA. Malaria: haemato- logical aspects. *Ann Saudi Med*. 2002; 22:372–377.
18. Dr. Ronak Bhalodia, Dr. Nirmal Chaudhari and Dr. Jyotin Shah. 2019. "Study of clinical profile of P. falciparum malaria in tertiary care hospital", *International Journal of Current Research 11, (12), 8748-8751*
19. Jagdish Prasad Goyal and Aarti M. Makwana Comparison of Clinical Profile between P. vivax and P. falciparum Malaria in Children: A Tertiary Care Centre Perspective from India, Malaria Research and Treatment Volume 2014, Article ID 132672, 4 pages http://dx.doi. org/10.1155/2014 /132672
20. Manju Kumari and Radha Ghildiyal, Clinical Profile of Plasmodium Vivax Malaria in Children and, Study of Severity Parameters in relation to Mortality: A Tertiary Care Centre Perspective in Mumbai, India, Malaria Research and Treatment Volume 2014, Article ID 765657, 6 pages http://dx.doi.org/10.11 55/2014/765657
21. Murthy RN, Rai S. Analysis of clinical profile and prescription pattern of malaria in a tertiary care hospital in Karnataka. Int J Basic Clin Pharmacol 2019; 8:1744-8.
22. Antony J, Celine TM, Chacko M. Staging back of Malaria in Kerala, India: A Retrospective study. Int Res J Social Sci. 2013;2(12):42-6
23. Narender Pal Jain*, Shweta Gupta*, Sanjeev Kumar Singla*, Sanchit Budhiraja* Rajesh Mahajan. Prospective Study Of The Clinical Profile Of Hospitalized Patients Of Malaria, NJIRM 2013; Vol. 4(4).July - August eISSN: 0975-9840 pISSN: 2230 – 9969
24. Murthy GL, Sahay RK, Srinivasan VR, Upadhaya AC, Shantaram V and Gayatri K. Clinical profile, of falciparum Malaria in a tertiary care hospital. J Indian Med Assoc. 20 00; 98(4): 160-2, 169.
25. Gupta et al. Clinical Profile and Prognostic Indicators in Adults Hospitalized with Severe Malaria Caused by Different *Plasmodium* Species. *Infectious Diseases: Research and Treatment* 2015:8 45–50 doi:10.4137/IDRT. S 34039
26. Shelat VV, Pandve HT, Pathak G. Sociodemographic characters, clinical profile and laboratory parameters in malaria cases due *Plasmodium falciparum* and *Plasmodium vivax* comparative study. J Med Trop 2014;16:76- 80
27. Pavithra H, Ismail IM, Kahar A, Bhargav S, Bharadhwaj SMG, Kumar MA, et al. Clinical profile and geographical distribution of malaria patients attending a tertiary care centre in Mangaluru, South India. Int J Community Med Public Health 2019; 6:4743-7.
28. Waris, R., Aurangzeb, B., Raza, S.H., Waris, A., Riaz, R. Clinical Profile and Spectrum of Complications of Malaria in Hospitalized Children at a Tertiary Care Hospital. Journal of Rawalpindi Medical College. 31 Dec. 2021; 25(4): 516-520. DOI: https:// doi.org/10.379 3 9/jrmc.v25i4.1752
29. Minhas A, Mane P, Sangwan J, Dhingra A. Pattern of severe malaria with special reference to *Plasmodium vivax* in pediatric population of the most aspirational region of North India. Int J Adv Med Health Res 2021;8:57-62.
30. Kumar A, Ahmar R, Kishore S, Gupta AK, Kumar R, Kumar M, Sharan S, Prakash J. Clinical profile of malaria in children at a tertiary care hospital of Bihar and evaluation of parasite LDH based rapid diagnostic test for malaria. *Panacea J Med Sci* 2021; 11(1):106-110.
31. Rathod SN, Chavan A, Sharma S, Rathod T, Khan N, Bavdhankar K. Changing clinical profile of malaria at a tertiary care hospital. Int J Adv Med 2018; 5:510-3.
32. Madhuri P. Kadam* Study of Clinical Profile of Malaria and its management in Pediatric age group at urban hospital, International Journal of Health and Clinical Research, 2021;4(2):244-248 e-ISSN: 2590-32 41, p-ISSN: 2590-325X
33. Virendra C. patil1, Harsha V. Patil, Clinical Profile and Outcome of Complicated Plasmodium falciparum Malaria, International Journal of Medicine and Public health [Int. J. Med. Public health] | Vol 2 | Issue 1 | 2012
34. Singh P, Mehta N, Tada NG. Comparison of clinical profile and severity of P. falciparum and P.Vivax malaria in a tertiary care hospital of Surat, India. Int J Contemp Pediatr 2016; 3:1288-92
35. Hirani MM, Vadhvana SK. Study of Clinical Profile of P.Vivax Malaria during Pregnancy. J Res Med Den Sci 2015;3(4):307-11