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Research Article

Clinical profile and laboratory parameters of severe *Plasmodium vivax* Malaria in Mewat region

Rakhi Jain[1], Meetu Yadav[2], Babita Khichar[3]

[1]Professor, [2]Associate Professor, [3]Assistant Professor, Department of Paediatric, Shaheed Hasan Khan Mewati, Government Medical College, Nalhar,Nuh, Haryana, India
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I N F O

Corresponding Author:
Babita Khichar, Department of Paediatrics, Shaheed Hasan Khan Mewati ,Government Medical College, Nalhar, Nuh, Haryana, India
E-mail Id:
babitakhichar7@gmail.com
Orcid Id:
https://orcid.org/0009-0003-4349-7256
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A B S T R A C T

Background: Malaria is one of the most infectious disease world wide with about 50% of world population being at risk for its serious complication. *Plasmodium vivax* has long been regarded a rather benign disease irrespective of its substantial morbidity in Asia and Central and South America. However, severe *vivax* malaria has been increasingly reported in recent years, particularly from India. In our region malaria incidence is very high, hence there is a need to study patients with *Plasmodium vivax* malaria presenting with complications, so they can be detected early and appropriate treatment can be started.

Materials and Methods: This retrospective cross-sectional study was conducted in the Department of Pediatrics at Shaheed Hasan Khan Mewati Government Medical College, Nuh, Haryana over a 1 year period. Children aged 1 month to 14 years with laboratory confirmed *Plasmodium vivax* mono-infection were included. Data on clinical features, laboratory parameters, complications, and outcomes were extracted from hospital records and analysed in terms of percentage and absolute values.

Results: A total of 51 children were enrolled. Most cases (64.7%) were in the 0-5 year age group, with a slight male predominance (52.9%).Fever was universal symptom(100%),followed by pallor (47%),vomiting(23.5%),abdominal pain (19.6%),and hepatosplenomegaly (23.5%).Hemoglobin <7g/dl was seen in 49%,and thrombocytopenia (<1lakh/mm^3) in 70.6%.Hyperbilirubinemia was found in 62.7% of patients. Complications were noted in 43.1% of children, including jaundice (19.6%),shock(11.8%),acute kidney injury(9.8%),and seizures (5.9%).ICU admission was required in 21.6%,and mortality occurred in 5.9% of cases.

Conclusion: Severe *Plasmodium vivax* malaria in children can present with life-threatening complications in children such as severe anemia, shock, acute kidney injury, neurological symptoms, and multiorgan dysfunction. Prompt recognition and appropriate management are crucial to reduce morbidity and mortality, especially in endemic and resource-limited settings.

Keywords: Plasmodium vivax, Severe malaria, children, complications, Anemia, Thrombocytopenia, India

Introduction

Malaria continues to be a major public health concern in India, particularly affecting vulnerable populations such as children. While *Plasmodium falciparum* has long been associated with severe malaria and high mortality, recent studies have highlighted the increasing burden and severity of plasmodium vivax infections, traditionally considered benign. Emerging evidence suggests that *Plasmodium vivax* can cause severe complications including cerebral malaria, severe anemia, thrombocytopenia, acute kidney injury, respiratory distress, and even death-especially in paediatric patients with delayed diagnosis or co-morbidities.[1,2]

India accounts for a substantial share of the global burden of *Plasmodium vivax* malaria cases, with states like Haryana being endemic. In rural and undeserved regions such as Mewat, delayed health-seeking behavior, poor access to healthcare, and malnutrition may contribute to the progression of uncomplicated *Plasmodium vivax* malaria to severe forms in children.

There is paucity of data from North India, particularly from rural and resource-limited settings, regarding the clinical and laboratory spectrum of severe *Plasmodium vivax* malaria in children. Understanding the local epidemiology and presentation is essential for early recognition and appropriate management. This study aims to describe the clinical profile, laboratory parameters, complications, and outcomes of paediatrics patients with severe *Plasmodium vivax* malaria admitted to a tertiary care hospital in the Mewat region of Haryana.

Materials and Methods

Study design and setting

This retrospective cross-sectional study was conducted in department of pediatrics at Shaheed Hasan Khan Mewati Government Medical College, Nalhar, Mewat(Nuh),Haryana over a one year period.

Study population

Children aged 1 month to 14 years admitted with confirmed *Plasmodium vivax* mono-infection were included. Diagnosis was made using peripheral blood smear (PBS) and/or rapid diagnostic test (RDT).

Severe malaria was classified according to recent National Vector Borne Disease Control Program India guidelines.[3]

Severe malaria is a confirmed case of malaria with any one or more complications such as cerebral malaria, convulsions, pulmonary edema/acute respiratory distress syndrome (ARDS),severe anemia (hemoglobin <5 g/dl), renal failure (serum creatinine >3 mg/dl),jaundice (serum bilirubin >3 mg/dl),

hypoglycemia (plasma glucose <40 mg/dl),metabolic acidosis, circulatory collapse/shock (systolic blood pressure <80 mmHg and <50 mmHg in children), abnormal bleeding and laboratory evidence of disseminated intravascular coagulation, hemoglobinuria, hyperthermia (temperature >106°F or >42°C),

and hyperparasitemia (>5% parasitized red blood cells [RBCs]).

All patients fulfilling these criteria were included in this study.

Children with mixed *Plasmodium* species infections or incomplete clinical or laboratory records were excluded.

Data collection

Demographic details, clinical presentation, laboratory investigations, treatment received, complications, and outcomes were retrieved from hospital records. Laboratory parameters included hemoglobin, total leukocytes count, platelet count, bleeding time, clotting time, liver and renal function tests, blood glucose, and serum electrolytes. Complications recorded were severe anemia, cerebral malaria, jaundice, renal failure, hypoglycemia, and respiratory distress.

Requirement for blood transfusion, ICU admission, duration of hospital stay and final outcome (recovery/death) were also recorded.

Ethical considerations

Ethical approval was obtained from on institutional ethical committee [IEC No. EC/OA -37/2019] approval letter dated 24 October 2019.The need for informed consent was waived off by the IEC as this was a retrospective study based on patients records.

Statistical Analysis

Data were compiled in Microsoft Excel and analysed using SPSS(Statistical Package for the Social Sciences).Descriptive statistics (mean, frequencies, percentages) were used for analysis. Continuous variables were presented as mean $\pm$ SD, and categorical variables as percentages.

Results

Out of 51 children included in this study, 33(64.7%) were aged between 0-5 years,13(25.5%) were aged >5-10 years, and 5(9.8%) were aged >10 to 14 years. The male to female ratio was approximately 1.1:1,with 27(52.9%) males and 24(47.1%) females.

All 51 children (100%) presented with fever. Other common symptoms included paleness of body(47.1%),chills and rigors (23.5%),nausea (23.5%),and vomiting (23.5%).Abdominal pain was reported in 19.6%,while fatigue or weakness

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occurred in 11.8% of patients. Less frequent symptoms included headache (7.8%),cough(11.8%),and difficulty in breathing (9.8%).Bleeding manifestations were noted in 5 patients (9.8%),and diarrhea in 2(3.9%).Rare symptoms such as muscle pain, constipation, and jaundice were each observed in one child (2%).Neurological symptoms included seizures (5.9%),altered sensorium (3.9%),and abnormal behavior (2%).Swelling was reported in 3(5.9%) children.

Hepatosplenomegaly was a common finding. Among the 51 children,12(23.5%) presented with both hepatomegaly and splenomegaly, while 3(5.9%) had isolated hepatomegaly and 3(5.9%) had isolated splenomegaly. No Hepatosplenomegaly was observed in 33(64.7%) cases.

Anemia was a prominent finding, with 25 children (49%) having hemoglobin <7 g/dl, while 19 children (37.3%) had levels between 7-10 g/dl, and 7 children (13.7%) had >10-13 g/dl.

Thrombocytopenia was observed in varying degrees:12(23.5%) had platelet counts <50,000/ mm^3,24(47.1%) had counts between 50,000-1,00,000/ mm^3,and 8(15.7%) had counts >1.5 lakh/mm^3. Hyperbilirubinemia was noted in 32 children (62.7%),with 25(49%) having serum bilirubin levels between 1-3 mg/dl and 7(13.7%) with levels >3 mg/ dl. Liver enzyme elevations were seen in a subset: AST>40IU/L in 5(9.8%) ,ALT>40 IU/L in 4(7.8%),and alkaline phosphatase elevation in 6(11.8%). Renal involvement, evidenced by raised serum creatinine, was found in 4 children (7.8%).

Coagulation abnormalities were observed in 3 cases (5.9%) with prolonged PT/INR, and 2 cases (3.9%) with raised activated partial thromboplastin time(aPTT).

A wide range of complications were observed in this study. Severe anemia (hemoglobin <5g/dl) was the most common, seen in 8 cases (15.7%),and 12 children (23.5%) required blood transfusion. Jaundice was present in 10 children(19.6%),while shock was documented in 6(11.8%). Acute kidney injury (AKI) occurred in 5 children (9.8%),and bleeding manifestations were seen in 5 cases(9.8%). Hemoglobinuria and acute respiratory distress syndrome (ARDS) were each observed in 3 children (5.9%),while impaired consciousness was noted in 2 children (3.9%). Seizures occurred in 3 cases (5.9%),hypoglycemia in 2 cases (3.9%),and hyponatremia in 4 children (7.8%).

Among the 51 children with severe *Plasmodium vivax* malaria,42 (82.4%) achieved complete recovery without residual complications.However,22 children (43.1%) experienced complications during the course of illness. Mean duration of hospital stay was 7 days. ICU admission was required in 11 cases (21.6%), indicating significant clinical severity. Despite intensive management, there were 3 deaths (5.9%),highlighting he potential for serious morbidity and mortality even with *Plasmodium vivax* infection in the pediatric population.

Table 1.Demographic Profile of Children with Severe *Plasmodium Vivax* Malaria

Parameters	Number of cases (n=51)	Percentage (%)
Age		
0-5 years	33	64.7%
>5-10 years	13	25.5%
>10-14 years	5	9.8%
Sex		
Male	27	52.9%
Female	24	47.1%

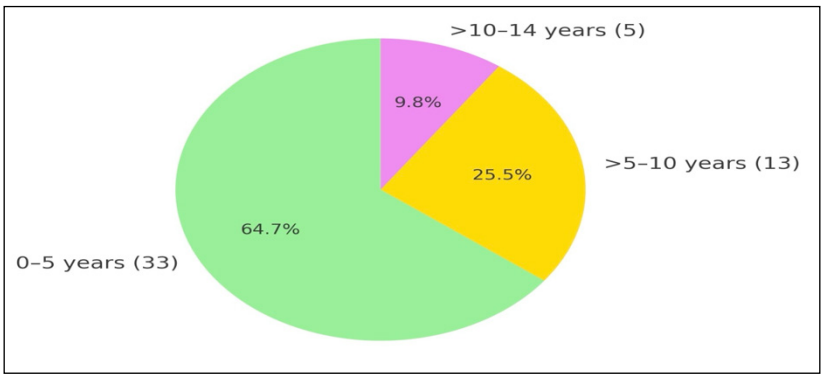

Figure 1.Age distribution of children with Severe *Plasmodium vivax* malaria

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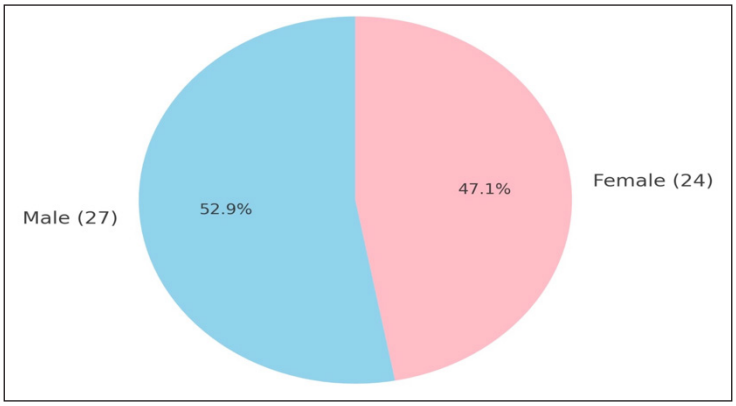

Figure 2.Gender distribution of children with Severe *Plasmodium vivax* malaria

Table 2.Clinical Profile of Children with Severe *Plasmodium vivax* Malaria

Clinical Presentation	Number of cases (n=51)	Percentage(%)
Fever	51	100%
Paleness of body	24	47.1%
Chills and rigors	12	23.5%
Nausea	12	23.5%
Vomiting	12	23.5%
Abdominal Pain	10	19.6%
Cough	6	11.8%
Fatigue/weakness	6	11.8%
Difficulty in breathing	5	9.8%
Bleeding manifestations	5	9.8%
Headache	4	7.8%
Generalised swelling	3	5.9%
Seizures	3	5.9%
Diarrhea	2	3.9%
Altered sensorium	2	3.9%
Muscle pain	1	2%
Constipation	1	2%
Jaundice	1	2%
Abnormal behavior	1	2%

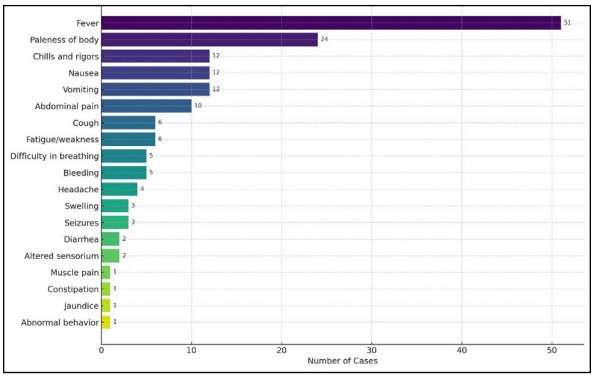

Figure 3.Clinical Profile of Children with Severe *Plasmodium vivax* Malaria

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Table 3.Distribution of Organomegaly in severe *Plasmodium vivax* malaria

Organomegaly	Number of cases (n=51)	Percentage (%)
Hepatosplenomegaly	12	23.5%
Hepatomegaly	3	5.9%
Splenomegaly	3	5.9%
No Hepatosplenomegaly	33	64.7%

Table 4.Lab Parameters at Admission

Parameters	Number of cases (n=51)	Percentage (%)
Hemoglobin (g/dl)		
<7 g/dl	25	49.0%
7-10 g/dl	19	37.3%
>10-13 g/dl	7	13.8%
Platelets count(/mm^3)		
<50,000	12	23.5%
50,000-1 lakh	24	47.1%
>1 lakh-1.5 lakh	7	13.7%
>1.5 lakh	8	15.7%
Serum bilirubin level		
1-3 mg/dl	25	49.0%
>3 mg/dl	7	13.7%
AST>40 (IU/L)	5	9.8%
ALT>40 (IU/L)	4	7.8%
Alkaline phosphatase(IU/L)	6	11.8%
Increased serum creatinine (mg/dl)	4	7.8%
Raised PT/ INR	3	5.9%
Raised APTT	2	3.9%

Table 5.Complications of Severe *Plasmodium vivax* Malaria

Complications	Number of Cases(n=51)	Percentage (%)
Severe anemia (Hb<5g/dl)	8	15.7%
Jaundice	10	19.6%
Shock	6	11.8%
Acute kidney injury	5	9.8%
Bleeding manifestations	5	9.8%
Hyponatremia	4	7.8%
Seizures	3	5.9%
Hemoglobinuria	3	5.9%
Acute respiratory distress syndrome	3	5.9%
Impaired consciousness	2	3.9%
Hypoglycaemia	2	3.9%
Blood transfusion required	12	23.5%

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Table 6.Outcome of Severe *Plasmodium vivax* Malaria

Outcome	Number of cases (n=51)	Percentage (%)
Complete recovery	42	82.4%
Developed complications	22	43.1%
Required ICU admission	11	21.6%
Mortality	3	5.9%

Discussion

This study highlights the significant clinical and laboratory burden of *Plasmodium vivax* malaria in children from the Mewat region of Haryana, challenging the long-held perception of *Plasmodium vivax* as a relatively benign infection. The findings align with growing evidence from India and other endemic regions that *Plasmodium vivax* can lead to severe and potentially life-threatening complications in pediatric populations.

The predominance of cases among children under five years of age (64.7%) aligns with previous studies, which suggest that younger children are more susceptible to severe disease because of their immature immune systems,making them more prone to repeated infections. Also, perhaps because, the Mewat region is the comparatively less developed area in India, people here lack awareness about basic hygiene and cleanliness leading to breeding of mosquitoes in stagnant water and more risk for malaria. The presence of protozoal and helminthic infections and malnutrition further adds to the plight.[4].Similarly, other studies from Mumbai and Punjab have reported greater involvement of less than five-year-old children compared to other children. [5,6].Furthermore, the clinical manifestations of severe malaria were seen more commonly in infants and young children compared to those aged more than 10 years.[7].

In our study, male children constituted 52.9% (n=27) and females 47.1%(n=24),indicating a slight male predominance.

This observation is consistent with findings from multiple Indian studies on *Plasmodium vivax* malaria in children. Taneja et al.[8] reported a male-to-female ratio of 1.2:1 in pediatric vivax malaria, while Kochar et al.[9] found 58% of their cases were males in a study from Rajasthan.

The observed mild male predominance may be explained by social and behavioral factors, including greater increased outdoor exposure among male children in endemic regions and a possible gender bias in health-seeking behavior, wherein male children are more frequently brought to healthcare facilities.In backward areas, female children may also have relatively greater body surface are coverage due to clothing practices,potentially reducing exposure. [5].However, some studies, including that by Gupta et al.[10],have reported an equal gender distribution in early childhood, suggesting that *Plasmodium vivax* infection is not inherently gender-specific.

Fever was universal, while pallor, vomiting, abdominal pain, and hepatosplenomegaly were also common-features typical of malarial infection but often indistinguishable from *Plasmodium falciparum* malaria. Similar findings were reported by many authors.[11,12,13].

Anemia was a major finding, with nearly half of the patients presenting with hemoglobin <7g/dl, and 8 cases with severe anemia (<5g/dl),several requiring transfusion. Two common causes of anemia are increased hemolysis and decreased rate of erythrocyte production from bone marrow whereas the malnutrition and intestinal parasitic infections aggravate this problem in highly endemic areas.

This is comparable to Taneja et al.[8],who reported severe anemia in 40% of children with *Plasmodium vivax* malaria. Gupta et al.[10] reported a similar prevalence (52%) of anemia in a North Indian cohort, underscoring the burden of hematological involvement.

Thrombocytopenia was observed in over 70% of patients, a finding reported in both vivax and falciparum infections, consistent with Kochar et al.[9] and Nathani et al.[14],who reported thrombocytopenia in 60-80% of pediatric vivax malaria cases. Despite low platelets counts, bleeding manifestations were relatively uncommon (9.8%), a finding similar to earlier study.[10]

Jaundice was present in 19.6% of our cohort, aligning with the 22% hepatic dysfunction rate reported by Sarkar et al.[15]

AKI was documented in 9.8% of cases in our study, which is consistent with the 6-10% incidence reported by Mishra et al.[16] and Das et al.[17]

Neurological manifestations, including seizures (5.9%) and altered consciousness (3.9%),were comparable to findings by Tanwar et al.[18] and Bhat et al.[19],where cerebral involvement was noted in up to 10% of *Plasmodium vivax* cases. Although rare, these complications emphasize the neurotropic potential of plasmodium vivax.

Notably,22 children (43.1%) developed complications, including acute kidney injury, shock, seizures, and acute respiratory distress syndrome. ICU admission was required in 21.6% of patients, and mortality was recorded in 3

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cases(5.9%).These figures underscore the capacity of *Plasmodium vivax* to produce clinical severity comparable to plasmodium falciparum, particularly in vulnerable populations.

The case fatality rate in our study was 5.9%,slightly higher than previous reports, possibly due to late referrals, limited critical care access, and high rates of malnutrition in this region. Similar challenges have been reported from other tribal and rural areas in India. Hassan et al. reported a case fatality rate of 1.73%.[7] These patients had severe anemia, multi-organ dysfunction, and shock. Kumari et al. reported a 4% case fatality rate.[5]

Our findings support the evolving understanding of *plasmodium vivax* malaria as a potentially severe infection. The high prevalence of complications demands early recognition and comprehensive management, particularly in resource-limited endemic regions like Mewat. Enhanced clinician awareness, early diagnosis, and prompt supportive care are essential to improve outcomes.

Strength

- This study adds to the limited data on severe *Plasmodium vivax* malaria in children from rural North India, particularly the Mewat region of Haryana, a previously under-reported endemic area.
- It is one of the few studies conducted exclusively in a pediatric population, highlighting the distinct clinical and laboratory features of severe *Plasmodium vivax* malaria in children.
- By using hospital records, the study reflects the actual burden and presentation in a resource-limited tertiary care setting, aiding in local health planning and early intervention strategies.

Limitations

- Being a retrospective study, it was dependent on the accuracy and completeness of medical records, which may have led to underreporting of some clinical or laboratory findings.
- As this was a single-center study, findings may not be representative of other areas with different endemicity patterns or healthcare infrastructure.
- Some advanced investigations (e.g., lactate or parasite load quantification) were not available due to resource constraints, limiting in-depth analysis of pathophysiology.

Conclusion

Severe *Plasmodium vivax* malaria can no longer be considered a benign disease ,especially in children. This study highlights that pediatric *Plasmodium vivax* infections in the Mewat region are associated with significant complications such as severe anemia, thrombocytopenia, and neurological involvement. Early recognition, prompt treatment, and improved access to healthcare are essential to reduce morbidity and prevent mortality. Further multicenter studies with larger sample sizes are needed to better understand the evolving clinical spectrum of *Plasmodium vivax* malaria in endemic regions.

Key points

- *Plasmodium vivax* malaria can cause severe and life-threatening complications in children, contrary to its traditionally benign classification.
- Early diagnosis and intervention in resource-limited settings are critical to improving outcomes in pediatric *Plasmodium vivax* malaria.
- Region-specific data from underserved areas like Mewat are vital to inform local health policy and malaria control strategies.

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Ethical approval

Ethical approval was obtained from on institutional ethical committee [IEC No. EC/OA -37/2019] approval letter dated 24 October 2019.The need for informed consent was waived off by the IEC as this was a retrospective study based on patients records.

Acknowledgement: The authors thank the institutional ethics committee for granting a waiver of individual consent for this retrospective study. The image used has been anonymized to protect patient identity.

Author Contributors: RJ,MY,BK: conceptualised the study, collected and interpreted the data and prepared the initial manuscript; RJ: supervised the study, revived literature and revised the initial manuscript. All authors approved the final version of the manuscript and are accountable for all aspects related to study.

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Conflict of Interest: The authors also declare that there are no conflicts of interest.

References

1. Anstey NM, Douglas NM, Poespoprodjo JR, Price RN. Plasmodium vivax: clinical spectrum, risk factors and pathogenesis. Advances in parasitology. 2012 Jan 1;80:151-201. [Google Scholar]
2. Baird JK. Evidence and implications of mortality associated with acute Plasmodium vivax malaria. Clinical microbiology reviews. 2013 Jan;26(1):36-57. [Google Scholar]

3. NVBDCP. Malaria. Shyam Nath Marg, Delhi: India; National Vector Borne Disease Control Programme; May 28 2025.Available from: https://nvbdcp.gov.in/index4.php?lang=1 and level=0 and linkid=424 and lid=3702. [Last accessed on 2018 Nov 01].
4. Goyal P, Lukhmana S, Dixit S, Singh A. Malnutrition and Childhood Illness among 1–5-year-old children in an Urban slum in faridabad: a cross-sectional study. Journal of epidemiology and global health. 2019 Mar;9(1):19-22. [Google Scholar]
5. Kumari M, Ghildiyal R. 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. 2014;2014(1):765657. [Google Scholar]
6. Mangla A, Goel A, Singh T. Changes in hematological manifestations in children with vivax malaria. International Journal of Contemporary Pediatrics. 2015 Apr;2(2):141.[Google Scholar]
7. Hassan N, Chalotra S, Aneja S. Clinico-hematological manifestations of malaria in children in Western Uttar Pradesh, India. Int J Contemp Pediatr. 2018 Sep;5:1904-8. [Google Scholar]
8. Harish R, Gupta S. Plasmodium vivax malaria presenting with severe thrombocytopenia, cerebral complications and hydrocephalus. The Indian Journal of Pediatrics. 2009 May;76(5):551-2.[Google Scholar]
9. Kochar DK, Tanwar GS, Khatri PC, Kochar SK, Sengar GS, Gupta A, Kochar A, Middha S, Acharya J, Saxena V, Pakalapati D. Clinical features of children hospitalized with malaria—a study from Bikaner, northwest India. The American journal of tropical medicine and hygiene. 2010 Nov 5;83(5):981. [Google Scholar]
10. Gupta P, Guddattu V, Rao PS. Clinical manifestations and predictors of severe *Plasmodium vivax* malaria in children: A prospective study from coastal India. Malar J.2019;18:30.
11. 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. [Google Scholar]
12. Muddaiah M, Prakash PS. A study of clinical profile of malaria in a tertiary referral centre in South Canara. Journal of vector borne diseases. 2006 Mar 1;43(1):29. [Google Scholar]
13. Devineni SB, Suneetha O, Harshavardhan N. Study of platelet count in malaria patients and the correlation between the presence and severity of platelet count with type of malaria. Journal of Evolution of Medical and Dental Sciences. 2015 Aug 20;4(67):11734-47. [Google Scholar]
14. Naithani R,Agarwal N,Chandra J,et al.Thrombocytopenia in *Plasmodium vivax* malaria.J Trop Pediatr.2006;52(3):218-20.
15. Sarkar D,Baidya S,Das C,Mandal R.Severe vivax malaria:an emerging threat in children?Trop Parasitol.2013;3(1):24-7.
16. Mishra SK,Mohanty S,Mohanty A.Severe *Plasmodium vivax* malaria in a tertiary care center in India: an observational study.Travel Med Infect Dis.2013;11(5):294-7.
17. Das S,Saha R,Kundu S.A comparative study of complications in severe *Plasmodium vivax* versus *Plasmodium falciparum* malaria in tertiary care hospital in Kolkata,India.Asian Pac J Trop Med.2013;6(9):705-8.
18. Tanwar GS,Khatri PC,Sengar GS,et al.Clinical Profile of 130 cases of severe *Plasmodium vivax* malaria from Bikaner,India.Am J Trop Med Hyg.2012;87(1):11-5.
19. Bhat SM,Jadhav UM.Neurological manifestations of *Plasmodium vivax* malaria.Ann Indian Acad Neurol.2013;16(1):15-8.

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DOI: https://doi.org/10.24321/0019.5138.202594