



MALARIA, TERRORIZING INDIA EVEN IN 21ST CENTURY

Internal Medicine

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ABSTRACT

Introduction: Although malaria is a preventable and potentially curable disease, in the war between malaria and humanity, malaria still has an upper hand. By the time the developed world has successfully achieved the level of near-elimination of malaria, third-world tropical countries like India are still terrorized by malaria, posing a huge burden to the health-care system in the endemic region and threat to the non-endemic countries by endangering their travelers. **Material and Method:** A retrospective cross-sectional study of 1032 malaria-positive cases who visited our tertiary care center between 1st January 2018 to 31st December 2018. Records of cases were studied and investigations were tabulated and the cause of death was evaluated. Data were computed and statistically analyzed. **Results:** 1032 cases were reported at our tertiary care center in the year 2018. Thrombocytopenia was the most common manifestation found in 87.75% of cases, out of which 50.59% of patients had severe thrombocytopenia. 144 patients had bleeding manifestation (mostly occurred when platelet count was less than 20,000/ μ l which was seen in 21.37% cases). Hepatic dysfunction was present in 42.66% of cases in this study. It manifested as jaundice in 40.31% of cases and deranged liver enzymes in 45.05% of cases whereas renal dysfunction was found in 15.45% of cases. 62.77% of patients were anemic of which 9.88% had severe anemia with hemoglobin less than 5gm%. Fever was the most common presenting complaint of patients followed by headache, nausea, and vomiting. 26 deaths were noted in this study, mortality being 2.51%. **Conclusion:** Malaria is an enormous global disease, and poses a huge burden to the healthcare system. The management of its complications could be done efficiently if recognized early. The way to achieve this would be by monitoring for the expected complications from an early stage itself. Reevaluation of the existing drills and taking steps to watch for complications like thrombocytopenia, hepatic and renal dysfunction, ARDS, bleeding, severe anemia, and cerebral malaria, to reduce the occurrence of its complication must be made into routine practice, especially in areas endemic to malaria.

KEYWORDS

Malaria, Thrombocytopenia, Mortality

INTRODUCTION

Malaria is a protozoan disease that occurs in almost all tropical countries of the world including India. Approximately a population of 3 billion people over 91 tropical countries are at risk of transmission of this protozoan disease by mosquito bite, of which 30 -50 crore cases are reported annually across the globe, causing approximately 1200 deaths every day.¹

Although mortality due to malaria has decreased in the past 15 years, owing to the efficient control program in developed countries, the prevalence of malaria has increased in tropical countries like India between 1970 to 2000.² As of 2017, the global burden of malaria contributes to 219million cases, with an estimated death of about 4,35,000 peoples.³

Although malaria is preventable and potentially curable, in the war between malaria and humanity, malaria still has the upper hand. By the time, the developed world has successfully achieved the level of near-elimination of malaria, third-world tropical countries like India are still terrorized by malaria, even in the 21st century, posing a huge burden to the healthcare system.

This misfortune is because of some challenges faced by India like poor funding, terrorist activity in malaria endemic zone, anomalous climate patterns, the emergence of anti-malarial resistance, etc. making malaria a serious public health issue in India even today and also posing threat to non-endemic countries and endangering travelers.

Plasmodium vivax malaria incidence shows a striking variation in the geographical distribution in the various parts of the nation.⁴

Various other Asian and African nations like Indonesia, Brazil, Thailand, and Papua New Guinea (PNG) have reported severe *vivax* malaria infection including autopsy confirmed 13 cases from Latin America.⁵⁻⁸ In recent years, *P. vivax* infection is showing a rise in

hospitalization rate, severity, and complications.⁵

Hence, an effort was made to study the paradigm of malaria, its complications, and mortality.

MATERIAL AND METHOD

A retrospective cross-sectional study of 1032 cases who visited our tertiary care center between 1st January 2018 to 31st December 2018 was carried out in patients with malaria infection. Records of cases were studied and the cause of death was evaluated. Data were computed and statistically analyzed.

Routine investigations like hemoglobin, TLC, platelet count, liver function tests, blood urea, serum creatinine, chest radiograph, and ultrasound scan of abdomen were done; also, specific investigations were advised wherever indicated to rule out other differential diagnoses.

Peripheral blood smear and MAL CARD (a rapid diagnostic test with sensitivity - 94.3% and specificity -99.6) were used for detecting malaria. MAL CARD was an immunoassay based on the sandwich principle detecting *Plasmodium* lactate dehydrogenase. Malaria patients with one of the following parameters were defined as severe:⁹ 1) severe malaria in the form of cerebral malaria, 2) severe anemia with hemoglobin level (Hb) < 5 mg/dL, 3) severe thrombocytopenia with platelet count < 50 000 /mm³ , 4) pancytopenia, 5) jaundice with serum bilirubin > 3 mg/dL, 6) splenic rupture, 7) acute renal failure with serum creatinine >3 mg/dL, 8) acute respiratory distress syndrome.

RESULTS

1032 cases were reported between 1st January 2018 and 31st December 2018 and the majority of these were reported in the rainy season showing the breeding of mosquitoes during the said period.

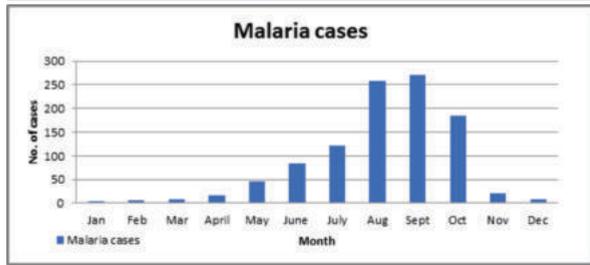


Fig. no. 1.: Number of malaria cases in different months

In our study, 87.75% had thrombocytopenia i.e., platelet count less than 1.5 lac/ μ l, out of which 50.59% of patients had severe thrombocytopenia i.e., platelet less than 50,00/ μ l. 144 patients had bleeding manifestations, of which 78 cases had petechiae, 39 cases had ecchymosis, and 27 had a subconjunctival hemorrhage. Bleeding manifestation mostly occurred in patients with platelet count less than 20,000/ μ l, which was seen in 21.37% of cases, in our study.

62.77% of patients had anemia with hemoglobin less than 11gm% of which 9.88% had severe anemia with hemoglobin less than 5gm%. Hepatic dysfunction was present in 42.66%, which manifested as jaundice (increased serum bilirubin was > 3mg/dL) in 40.31% cases and as deranged liver enzymes (SGOT/SGPT) in 45.05% cases. Renal dysfunction was found in 15.45% of cases having serum creatinine of more than 3mg/dL. Fever was the most common presenting complaint of patients followed by headache, nausea, and vomiting. Pleural effusion and ascites were observed in 14 and 32 cases respectively.

26 deaths were noted in this study. Of these 11 cases were of cerebral malaria, 4 cases had ARDS, 5 cases had renal dysfunction, 3 had hypotension, 1 had severe anemia, 1 had severe metabolic acidosis and 1 had hypoglycemia. Most of the death occurred in September i.e., 15 followed by 10 in October and 1 death occurred in July and August each. This makes the mortality to be 2.51%.

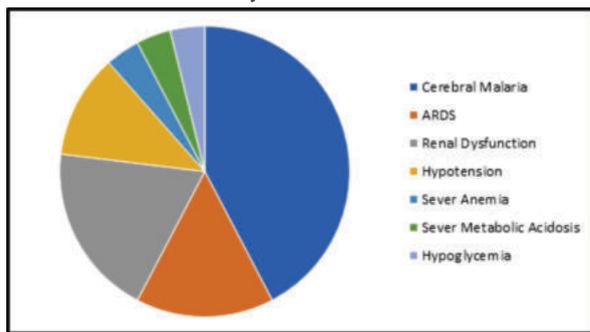


Fig. No. 2.: Cause of death in malaria infection

P. vivax malaria cases out-numbered *P. falciparum*, hence it is considered more fatal than *P. falciparum* owing to its huge number, relapse, and its life-threatening clinical syndrome. In our study, it is observed that out of 1032 cases, 894 were *P. vivax* and only a small number of 30 cases of *P. falciparum* were present. Mixed infection of *P. vivax* and *P. falciparum* were 108. Out of 26 deaths, 15 were due to *P. vivax*, 2 were due to *P. falciparum* and 9 were due to mixed infection.

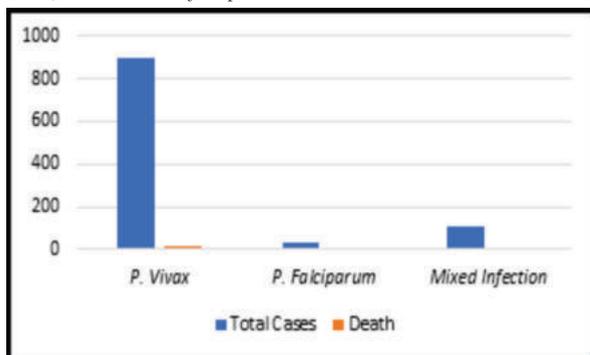


Fig. no. 3. & Table no. 1.: Number of cases of *P. vivax*, *P. falciparum*, and Mixed Infection and its mortality

Types of Malaria	Total cases	Death
Plasmodium vivax	894	15
Plasmodium falciparum	30	2
Mixed Infection	108	9

DISCUSSION

From this study, we inferred that malaria infections were not uncommon with 1032 cases reported at a single center in the year 2018. The incidence of malaria is sufficient enough to pose a huge burden to the healthcare system. The fertile breeding area for mosquitoes is a result of poor sanitation and ill-planned rapid urbanization, attributing to an increase in the number of malaria cases.

In this study, thrombocytopenia was the most common manifestation i.e., 87.75% had a platelet count less than 1.5lac/ μ l, out of which 50.59% patients had severe thrombocytopenia i.e. platelet less than 50,00/ μ l. The mechanism of this thrombocytopenia in malaria is understood poorly. Immune destruction by the formation anti – platelet antibodies¹⁰, splenic dysfunction, and oxidative stress are some of the postulated mechanisms of thrombocytopenia in malaria. There might be a direct interaction between platelet and plasmodium leading to thrombocytopenia.^{11,12}

Hepatic dysfunction was present in 42.66% of cases in this study. The manifestation of it was seen as Jaundice in 40.31% of cases and deranged liver enzymes in 45.05% of cases. The hepatic dysfunction is probably due to the direct hepatic injury caused by plasmodium.

Severe anemia with hemoglobin less than 5gm% was seen in 9.88% of cases in this study. Accelerated removal of RBCs by the spleen, ineffective erythropoiesis, and obligatory RBC destruction at parasite schizogony are some postulated mechanisms for anemia in malaria.

Renal Dysfunction was found in 15.45% of cases. The postulated mechanism of renal dysfunction is considered to be renal ischemia resulting in acute tubular necrosis and eventually renal dysfunction.

A study by George P, Alexander LM et al. at a tertiary hospital in malaria endemic urban area found similar results in *P. vivax* malaria i.e., complications observed were thrombocytopenia 93.3%, severe anemia in 10%, hepatic dysfunction in 43.3%, renal dysfunction in 26.7%.¹³

Table 2. Comparative Study Showing Thrombocytopenia, severe anemia, renal and hepatic dysfunction.

Authors	Study year	Thrombocytopenia	Severe Anemia	Renal Dysfunction	Hepatic Dysfunction
Current Study	2018	87.75%	9.88%	15.45%	42.66%
George P, Alexander LM et al.13	2010	93.30%	10%	26.70%	43.30%
Cheryl L, Maki JN, Rathod PK et al.15	2012-15	89%	7%	32.85%	36.40%
Kumari M, Ghildiyal R et al.16	2014	94%	23%	10%	7.33%

Another study by Mohapatra MK et al.¹⁴ on 110 patients and other studies tabulated in table 2 also found severe forms of malarial infection like jaundice, cerebral involvement, severe anemia, thrombocytopenia, and renal dysfunction and this was in concordance with our study.

Thus, from studies similar to our study, it can be inferred that thrombocytopenia, hepatic and renal dysfunction, cerebral malaria, severe anemia, ARDs, and bleeding manifestations were seen frequently in malaria. 26 deaths were noted in this study. Of these deaths, 11 cases were of cerebral malaria, 4 cases had ARDS, 5 cases had renal dysfunction, 3 had hypotension, 1 had severe anemia, 1 had severe metabolic acidosis and 1 had hypoglycemia.

P. vivax malaria prevalence has strikingly increased in the recent past. Moreover, the rate of hospitalization, complication, and severity of *P. vivax* is also found to increase in recent decades.² Thus, *P. vivax* which was previously thought to be benign is no longer considered to be benign. In our study, it is observed that a huge number of *P. vivax* (894

out of 1032 cases) poses an increased risk of complication and severity in form of bleeding, ARDS, hepatic and renal dysfunction, anemia, and thrombocytopenia. Moreover, due to the huge area of distribution of *P. vivax*, it is considered more fatal than *P. falciparum* (in our study, out of 1032 only 30 cases of *P. falciparum* were reported). Mortality of *P. vivax* also increases due to its tendency to relapse and its association with various life-threatening syndromes.^{17,18}

In our study, 108 cases of mixed infection were reported, and out of these 9 died. Thus, it can be inferred that mixed infection causes higher mortality than *P. vivax* or *P. falciparum* alone. In areas of high endemicity, higher rate of complications like coma, severe anemia, and higher case fatality rates were seen in mixed infections of *P. falciparum* and *P. vivax*. On the contrary, areas of low endemicity showed that mixed infections were associated with lesser severity.^{19,20}

Careful monitoring leads to early recognition of complications of malaria, which is considered a cornerstone in the management of malaria. Re-evaluation of the existing drills and appropriate management of complications of malaria should be done, to deal with this preventable and potentially curable disease.

CONCLUSION

Malaria is a disease that materializes with the involvement of an array of systems. In this study, thrombocytopenia, hepatic and renal dysfunction, cerebral malaria, severe anemia, ARDS, and bleeding manifestation were seen frequently associated with malaria. Malaria cases should be monitored for the occurrence of various complications as their early recognition and timely treatment or referral at a higher center can be life-saving. This creates a need for urgency to re-evaluate the control measures that can be undertaken to control this preventable and potentially curable disease.

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