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Pathology

Anaemia and Thrombocytopenia in Malaria Positive Cases- A Comparative Studies in a Referral Laboratory

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Abstract **Original Research Article**

Malaria is one of the major health problems in worldwide particularly Southeast Asia, with significant number of morbidity and mortality. There are significant changes happen in haematological parameters of a malaria positive cases, out of which anaemia and thrombocytopenia are two quite common parameters associated with malaria positive cases. This study performed in one of the referral laboratories of Kolkata between June 2023- September 2024, within this time span 104 positive malaria cases have been reported. Complete blood count has been performed in five parts fully automated Sysmex instrument. The diagnosis of malaria is confirmed by thick and thin blood films stained by Leishman stain and by antigenic strip tests. Out of 104 cases 87 (83.65%) cases were positive with plasmodium vivax infection, 15(14.42%) cases were positive with plasmodium falciparum infection and 02 (1.92%) cases were showing mixed infection. Among the haematological parameters 77 cases (74.03) cases were showing mild to moderate degree of anaemia and 94 cases (90.38%) showing thrombocytopenia.

Keywords: Malaria, Anaemia, Thrombocytopenia.

INTRODUCTION

Malaria is one of the most prevalent parasitic infections commonly found in tropical, subtropical countries of Asia & Africa. This infectious disease primarily caused by Plasmodium species, four species of Plasmodium can cause malaria (P. falciparum, P. vivax, P. malariae, and P. ovale) but P. falciparum can cause significant infection & mortality, after P. falciparum P. vivax is the next most significant malaria species but they sometime coexist also. The disease usually transmitted by the bite of infected female anopheles' mosquito from one infected person to another person thus female anopheles mosquito act as a vector. Despite of advances in medical sciences malaria continue to cause significant morbidity and mortality particularly in pandemic areas and it causes 1.5-2.7 million deaths worldwide [1].

Incubation period of malaria varies from 8-30 days depending upon the species of malaria. Plasmodium vivax, plasmodium ovale, plasmodium malariae causes low levels of parasitaemia, mild anaemia and in rare instances splenic rupture and nephrotic syndrome. Plasmodium falciparum causes high levels of parasitaemia, severe anaemia, cerebral symptoms, renal failure, pulmonary oedema and death. Clinical presentations of malaria include- fever, chill rigor, headache, diarrhoea, vomiting, abdominal distension, cough, hepatomegaly, and splenomegaly [2-4, 7, 8]. Haematological abnormalities that have been reported are anaemia, thrombocytopenia, atypical lymphocytosis, however leukopenia, leucocytosis, neutropenia, neutrophilia, monocytosis has also been reported [5-7]. High mortality rate in malaria infection is usually associated with heavy parasite load, anaemia, low platelet count, jaundice, & delay in diagnosis.

AIM & OBJECTIVES

The aim of this study is to find out different haematological parameters due to malaria infection particularly with haemoglobin level and platelet count.

MATERIALS & METHODS

This is a cross-sectional study done in a referral laboratory of Kolkata, West Bengal, India. This study has been done over a period of 1 year 03 months from June 2023- September 2024. Clinically suspected cases of malaria who provided blood samples for diagnosis of malaria have been included in this study. Confirmation of malaria has been with identification of different stages

of malaria parasite in thick and thin smear stained with Leishman stain and antigenic studies of malaria species. We excluded the cases of dengue, bleeding disorder, chronic liver diseases based on history and other clinical investigations. This study conducted after dully filled consent from patients.

RESULTS

This study includes 104 positive malaria cases with age range between 5-76 years, out of 104 cases 65 are male patients and 39 are female patients (Table 1). In this study 87 (83.65%) patients infected with plasmodium vivax infection, 15 (14.42%) patients infected with plasmodium falciparum infection and 02 (1.92%) patients are having both plasmodium vivax and plasmodium falciparum infection (Table-2). Out of all positive malaria cases 77 patients are showing mild to moderate degree of anaemia, which is mostly normocytic normochromic blood picture, and, in few cases, it shows microcytic hypochromic blood picture. 62 (80.51%) patients infected with Plasmodium falciparum are showing signs of anaemia, 13 (16.88%) patients infected with plasmodium falciparum and 02 (2.59%) patients infected with both Plasmodium vivax and Plasmodium falciparum are showing some signs of anaemia (Table-3). Out of all 104 positive malaria cases 94 patients are showing decrease platelet count or thrombocytopenia, 77 (81.91%) patients infected with Plasmodium vivax, 15 (15.95%) patients infected with Plasmodium falciparum and 02(2.12%) patients with mixed infection are showing features of thrombocytopenia in peripheral blood picture.

Table 1: Shows male and female distribution

Male	Female
65 (62.5%)	39(37.5%)

Table 2: Distribution of plasmodium species in malaria infected cases

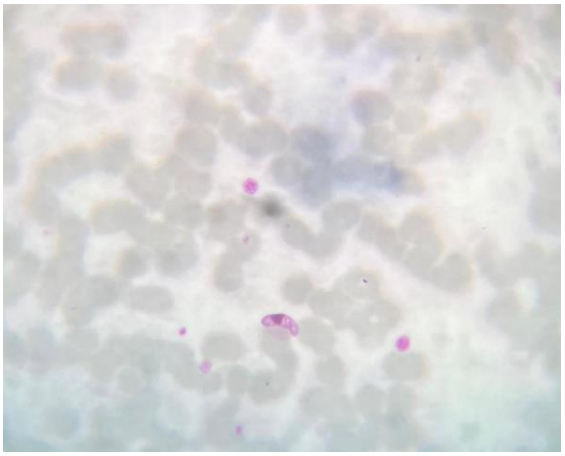
Species	Number of cases	Percentage
Plasmodium vivax	87	83.65%
Plasmodium falciparum	15	14.42%
Mixed infection	02	1.92%
Total	104	100%

Table 3: Distribution of anaemic patients in different plasmodium species

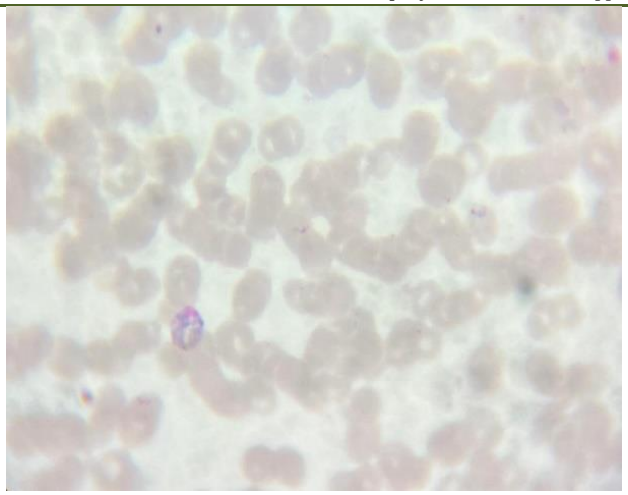
Species	Number of cases	Percentage
Plasmodium vivax	62	80.51%
Plasmodium falciparum	13	16.88%
Mixed infection	02	2.59%
Total	77	100%

Table 4: Distribution of thrombocytopenia in different plasmodium species

Species	Number of cases	Percentage
Plasmodium vivax	77	81.91%
Plasmodium falciparum	15	15.95%
Mixed infection	02	2.12%
Total	94	100%



Picture shows Gametocyte form of Plasmodium falciparum



Picture shows trophozoite form of Plasmodium vivax and thrombocytopenia

DISCUSSION

Malaria is one of major health related problem in tropical & subtropical area. Morbidity & mortality is mainly related to delay in diagnosis and treatment of this potentially curable disease. Haematological changes related to malaria are quite familiar, but precise changes are related to species of malaria, background of hemo globinopathy, geographic area and host immunity [8, 9]. In this study we also got various significant changes related to haemoglobin and platelet count in malaria affected patients. In this study we got 77 patients are having mild to moderate degree of anaemia which is consistent with other studies [5-9]. The reason for anaemia is multi factorial probably its due to destruction of parasitized red blood cells in spleen, accelerated removal of parasitized and non-parasitized red blood cells by spleen, sometimes Plasmodium falciparum cause suppression of erythropoietin level and anaemia of chronic diseases [8, 9]. Tumour necrosis factor alpha (TNF-α) has also been implicated and may cause ineffective erythropoiesis [11]. Normocytic normochromic type of red blood is predominant finding in most of the cases and it's directly related to the degree of parasitaemia. In few cases reticulocyte count is increased due to increased erythroid activity in bone marrow [12].

In our study 94 patients show feature of thrombocytopenia, these is consistent findings with other investigators like Shamim Akhtar *et al*., (71.06%) [9], Robinson *et al*., (71%) [14], Rodriguez *et al*., (58.97%) [15], Bashwari *et al*., (53%) [16]. Patients who develop thrombocytopenia in malaria cases are seldom bleed whatever the grade of thrombocytopenia. The cause of thrombocytopenia in malaria cases are poorly understood however researcher have proposed following mechanisms as cause of thrombocytopenia in malaria cases:

- Decreased thrombo poiesis however bone marrow examination shows normal or increased number of megakaryocytes [6]
- Peripheral destruction of platelets.
- Sequestration of platelets in spleen.
- Some scientists have found disseminate intravascular coagulation (DIC) as a cause of thrombocytopenia [17], however other scientist did not find DIC as a cause of thrombocytopenia.

There is no significant difference in platelet count between Plasmodium vivax and Plasmodium falciparum positive patients.

According to Jitendra Kumar *et al*., [18] not only decreased platelet count occurs in malaria patients also platelet dysfunction commonly encountered. According to them two types of platelet dysfunction occur – platelet hyperactivity, platelet hypo activity. Hyperactivity results from various aggravating agents like immune complexes, platelet surface contact with infected RBCs and damage to endothelial cells. Injured platelet undergoes intravascular hemolysis and releases cellular contents of the platelets that activate intrinsic coagulation cascade, as contributed to DIC. The hyperactive platelets may enhance haemostatic responses and that is why bleeding episodes are very rare in acute malarial infections, despite significant thrombocytopenia.

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