Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2015; 3(5D):2078-2081 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2015.v03i05.056

Research Article

Hematological parameter in malaria cases: a comparative study in a tertiary care hospital

Dr Subhasish Saha*[1], Dr Dipkana Das[2]
[1, 2]Assistant Professor, Department of Pathology, Kamineni Institute of Medical Sciences, Narketpalli, Telangana 508254, India

***Corresponding author**
Dr Subhasish Saha
Email: drsubhasishsah83@gmail.com

Abstract: Malaria is a major health problem particularly in South East Asia, with significant number of morbidity & mortality. Reduction in the number of blood cells & mild to moderate thrombocytopenia is quite common association with malaria. This observational study included 74 patients who attended outpatient department & inpatient department of Kamineni Institute of Medical Sciences, Andhra Pradesh, during August 2014- July 2015. Complete blood count was performed in automated cell counter Sysmex machine. The diagnosis of malaria is confirmed by thick & thin blood films stained by leishman stain and by antigenic strip test. Out of 74 confirmed malaria cases 58 cases were found positive with plasmodium vivax infection, 12 cases were found positive with plasmodium falciparum infection & other 4 cases were positive for both plasmodium vivax & falciparum infection. Among different hematological parameter 64 cases (86.48%) show mild to moderate degree anemia, 61 cases (82.43%) show thrombocytopenia, 21 cases (28.37%) show leucopenia & 37 cases (50%) show monocytosis. Malaria can cause significant hematological changes with high incidence of anaemia, thrombocytopenia, and monocytosis.
Keywords: Malaria, thrombocytopenia, anemia, monocytosis.

INTRODUCTION

Malaria is one of the most prevalent parasitic infection common in tropical, subtropical countries particularly Asia & Africa. Malaria is an infectious disease usually caused by Plasmodium species. The disease is usually transmitted from one infected person to another infected person through the bite of infected female anopheles mosquito, thus female anopheles mosquito acts as a vector. In spite of recent advance in science, malaria continues to cause significant morbidity & mortality worldwide. More than 40% population reside in malaria endemic area & it cause 1.5-2.7 million deaths in each year [1]. Mortality rate is slightly higher in case of severe infection. 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.

Incubation period of malaria varies from 8-30 days depending upon species. Clinical presentations of malaria include- fever, chill rigor, headache, diarrhea, vomiting, abdominal distension, cough, hepatomegaly, and splenomegaly [2-4]. Hematological abnormalities that have been reported are anaemia, thrombocytopenia, atypical lymphocytosis, however leucopenia, leucocytosis, neutropenia, neutrophilia, monocytosis are also been reported [5-7].High mortality rate in malaria infection are usually associated with heavy parasite load, anaemia, low platelet count, jaundice, & delay in diagnosis.

AIM & OBJECTIVES

The aim of this study was to find out changes of different hematological parameter due to malaria infection such as- hemoglobin, total & differential leucocytes count and platelet count.

MATERIALS & METHODS

This is a cross sectional study done in central hospital laboratory of Kamineni Institute of Medical Sciences, Nalgonda in Telengana district of India. This study done over a period of 1 year from August 2014-July 2015. Clinically suspected cases of malaria were included in this study. Confirmation of malaria was done by identification of malaria parasites in thick & thin peripheral smears stained by leishman stain and antigenic test of malaria parasite. We excluded the cases of dengue, bleeding disorder, chronic liver diseases on the basis of history and other clinical investigations. Those patients not willing for admission, investigation were excluded from this study. This study conducted

after clearance of the ethical committee of the institute and with dully filled consent of patients.

RESULTS

This study includes 74 patients with malaria infected in the age range between 11-72years, out of 74 cases; 41 are male patients & 33 are female patients [Table-1]. Plasmodium vivax is common (58 cases) compared to plasmodium falciparum (12 cases) infection while 4 patients infected with both vivax & falciparum infection [Table-2]. Out of all malaria cases 64 patients present with anaemia. Among these 64 cases 50 patients suffering from Plasmodium vivax infection, 11 patients suffered from Plasmodium falciparum infection & rest 3 patients infected with both Plasmodium vivax & Plasmodium falciparum [Table-3].Peripheral smear of these 64 patients show predominantly normocytic normochrmic red blood cells(RBC)-41 cases& 23 patients show feature of normocytic hypo chromic RBCs [Table-4]. Among total leucocytes count 21 patients show hematological picture of leucopenia 40 patients show blood picture of normal leucocytes count and rest of 13 patients presented with leucocytosis. Out of 21 cases who present with leucopenia, 12 of them affected with Plasmodium vivax, 7 patients affected with Plasmodium falciparum infection and 2 patients presented with both Plasmodium falciparum & Plasmodium vivax infection [Table-5]. In differential leucocytes count 62 cases show normal neutrophil count other 12 patients show neutrophilia, 58 patients present with normal lymphocyte count 08 cases show increased lymphocyte count whereas rest 08 cases show lymphopenia, monocyte count was increased in half of the studied patients, eosinophil count was normal in 55 patients whereas 19 patients show eosinophilia, basophil count was normal in all of patients. Among platelet count majority of the patients show feature of thrombocytopenia (61 cases). Out of these 61 patients' 48 patients affected by Plasmodium vivax infection, 10 cases affected by Plasmodium falciparum & 03 cases suffered from mixed infections. [Table-6].

Table 1: Shows male & female distribution.

Male	Female
41 (55.40%)	33 (44.59%)

Table 2: Distribution of Plasmodium species in malaria infected cases.

Species	Number of cases	Percentage
P. vivax	58	78.37%
P. falciparum	12	16.21%
Mixed infections	04	05.40%
	74	100%

Table-3: Distribution of anaemic patients in different Plasmodium species.

Species	Number of cases	Percentage
P. vivax	50	78.12%
P. falciparum	11	17.18%
Mixed infections	03	04.68%
	64	100%

Table-4: Show feature of red blood cells in different Plasmodium species.

Species	Normocytic normo chromic RBC (41 cases)	Normocytic hypo chromic RBC (33 cases)
P. vivax	32	18
P. falciparum	08	03
Mixed infections	01	02

Table-5: Distribution of leucopenia in different Plasmodium species.

Species	Number of cases	Percentage
P. vivax	12	57.14%
P. falciparum	07	33.33%
Mixed infections	02	09.52%
	21	100%

Table-6: Distribution of thrombocytopenia in different Plasmodium species.

Species	Number of cases	Percentage
P. vivax	48	78.68%
P. falciparum	10	16.39%
Mixed infections	03	04.91%
	61	100%

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. Hematological 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]. In our study we got significant changes related to hemoglobin, total leucocytes count and platelet count. In our study we got 64 patients (86.48%) suffering from anaemia, a finding which is parallel to other scientists [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]. Tumor necrosis factor alpha (TNF-α) has also been implicated and may cause ineffective erythropoiesis [10].

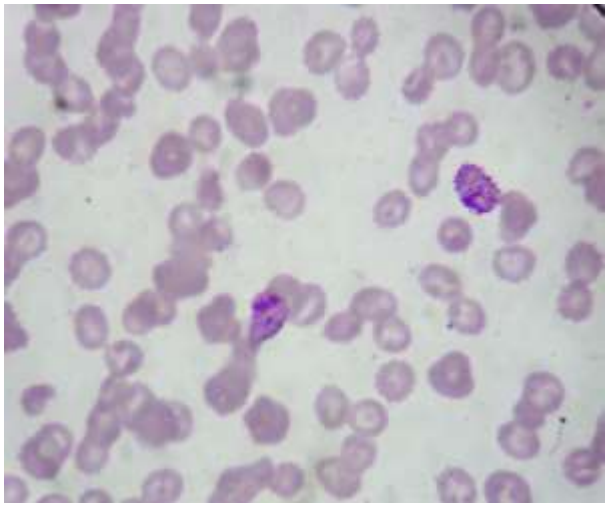

Fig 1: Showing gametocyte stage of Plasmodium vivax and thrombocytopenia in peripheral blood smear.

Anaemia develops due to direct parasitization of red blood cells by plasmodium species and thus leading to destruction of red blood cells. Normocytic normochromic type of red blood is predominant finding in most of the cases and it's directly related to the degree of parasitemia. In few cases reticulocyte count is increased due to increased erythroid activity in bone marrow [11].

In 21 cases (28.37%) we got leucopenia a finding similar to study done by Okoroiwu Ijeoma *et al.;* [12]. The result of leucopenia is due to infection caused by malaria parasite, administration of chemotherapy and as erythropoiesis is affected leucopoiesis is also affected. Among the differential leucocytes count most of patients show normal neutrophil, lymphocyte count. Only few of patient show decreased neutrophil and lymphocyte count and that is due to increased removal of leucocytes from the system of macrophage or the administration of anti malarial drugs [12]. In about 50% of cases we got monocytosis which is usually associated with protozoal infections (malaria, kala-azar, and tryponosomiasis), this finding is similar to study conducted by others [12].

In our study 61 patients (82.43%) show feature of thrombocytopenia, these is consistent findings with other investigators like Shamim Akhtar et al.; (71.06%) [8], Robinson et al (71%) [13], Rodriguez et al (58.97%) [14], Bashwari et al.; (53%) [15]. There was no significant difference in the incidence of thrombocytopenia in Plasmodium vivax patients (96%) and Plasmodium falciparum patients (90%). 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 show 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 [16], however other scientist did not found DIC as a cause of thrombocytopenia.

According to Jitendra Kumar *et al.;* [17] 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.

CONCLUSION

This study concludes Plasmodium falciparum, Plasmodium vivax can cause significant hematological changes includes- anaemia, leucopenia, thrombocytopenia. These hematological parameters can be used as a reliable diagnostic marker for supporting malaria in presence of PBS negative for malaria parasite.

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