RESEARCH PAPER | Medical Science | Volume : 5 | Issue : 12 | December 2015 | ISSN - 2249-555X

Study of Clinical and Laboratory Profile in Malaria

KEYWORDS: Malaria, Plasmodium falciparum, Severe Anaemia, Thrombocytopenia.

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ABSTRACT ***Background and Objectives:*** *Malaria is a major health problem in many parts of India . Several factors have been attributed to increased morbidity and mortality in malaria with altered haematological and coagulation parameters playing an important role.*
Material and Methods: *50 patients of Malaria confirmed by PS, MPQBC or Antigen Assay underwent detailed clinical history, thorough physical examination and investigated with haematological, required routine and special investigations. This was followed by monitoring the outcome of the patients with respect to morbidity and mortality.*
Results: *Of the 50 patients 8 patients had severe anaemia (Hb% <6gm %) and all of these patients were falciparum and mixed infection cases. Thrombocytopenia was observed in 60% of the patients and severe thrombocytopenia (<50,000 cumm) was seen in 5% of the patients. PT and APTT were increased in 22% and 11% of the cases respectively. BT was increased in 5% of the cases. 1 patients in the study expired.*
Conclusion: *Severe Anaemia is a poor prognostic factor and has adverse outcome. Increased BT is associated with high mortality. Mixed infection behaves like falciparum malaria.*

INTRODUCTION

Worldwide prevalence of malaria is about 300- 500 million per annum. The total economic loss is estimated to be approximately 0.5- 1 billion per annum. There has been a lot of development in antimalarial drugs. Even with these advances we are not able to completely control or eradicate malaria. Still many deaths occur due to malaria. In India steps were taken to control malaria such as: National Malaria Control Programme in 1953. This was a huge success. So Government came out with National malaria eradication programme in 1958. Malaria re-emerged in 1960.Later government came with MPO in 1977[1].

Even with all these efforts the mortality due to malaria in India is 50000 per year. This work of ours puts in an effort to study the symptoms, signs and haematological changes in malaria and co relate to its clinical outcome.

AIMS AND OBJECTIVES

- To study symptoms and signs in patients with malaria.
- To determine the haematological abnormalities in patients with malaria.
- To correlate the haematological and clinical profile with the severity and final outcome.

MATERIALS & METHODS

The study was carried out on 50 patients admitted in the hospital. A detailed history was taken followed by a detailed clinical examination after taking their consent.These investigations were done before the antimalarial treatment was started.

The following investigations for haematological and coagulation parameters were carried out :

- Haemoglobin estimation by cyanomethemoglobin method,
- RBC count by total and differential counts using Neaberg's chamber.
- Total platelet count by modified Dacie Leurs method.
- Whole blood clotting time by Lee white method.
- Prothrombin time, activated partial thromboplastin time.
- ESR estimation by Westergren method.
- Bone marrow aspiration was considered in patients with pancytopenia only.
- PCV by Wintrobe method.

Inclusion criteria

Fever proved to be malaria either by Peripheral smear examination

(both thick and thin smear) or MPQBC or by Malarial antigen Assay

Exclusion Criteria

- Fever of any other cause

Other Investigations which were carried out are

- Fasting blood sugar
- Blood urea
- Serum creatinine
- Liver function tests
- Chest x-ray PA view

Once the patient was diagnosed to have malaria they were started on Anti-Malarial drugs according to the new WHO guidelines for treatment of Malaria. Other supportive treatment was given according to the patients conditions.

RESULTS

The patients were analysed on the basis of sex(table 1), age(table 2), urban rural(table 3) ,symptoms and signs(table 4 and 5)

Investigations

On investigations we found different species (fig 1) association of anaemia and splenomegaly(table 6), association of thrombocytopenia and splenomegaly(table 7) and WBC abnormalities(table 8)

Hyperbilirubinaemia

It was noted in 16% of the total case. Hyperbilirubinaemia was seen in 22.2% of the patients with falciparum malaria

Volume : 5 | Issue : 12 | December 2015 | ISSN - 2249-555X

and 20% of the patients with mixed infections. It was not noted in patients of vivax malaria.

Chest x-ray
Chest x-ray shows features of pulmonary oedema in 8% of the

patients. Among these 3 are patients with falciparum malaria i.e. 11.11% of cases. 20%of the patients with mixed infection had sign of pulmonary oedema on chest x-ray. No features of pulmonary odema were found in patients with vivax malaria.

Outcome
Out of the 50 patients only 1 patient expired. The subject had falciparum malaria.

DISCUSSION
In our study the male to female ratio was 1.94:1 and compared to **Bhakshi et al**[1] the females affected were more in our study. The incidence of malaria was more in men than in women due to the working pattern i.e men are exposed to mosquito bites outdoors whereas women are less exposed.

The working group is the age group which is predominantly affected, because this is the group which is exposed to the mosquito bites especially in the fields and outdoors. Also our study follows the age pyramid in our country where the base is formed by young people and apex by the older age who constitutes lesser percentage of the population. In a study by **Malhotra et al** the percentage of people above 60 years was 4%[46]. Our study shows the percentage of people affected over 60 yrs is 12%.

Fever was the most predominant complaint in our study i.e 96% of the patients presented with fever and 78% of the patients had chills and rigors. In the study conducted by **Mehta et al**[2] fever was present in 100% of the patients and it was 96% in the studies conducted by **Naval hospital**[3] It was also noted that 28% of the patients in our study had easy fatigability as their presenting complaint.

Vomiting was observed in 43.3% of the patients in the study conducted by **Mehta et al**[2] and it was seen in 48% of the patients with our study. It was seen in 23% of the patients in the study conducted by **naval hospital**. The percentage of vomiting was high in our study as the number of patients with malaria had been treated with oral drugs outside which might have lead to gastritis.

Cough and breathlessness was a presenting complaint in 4.47% of the patients in the study conducted by **Mehta et al**[2] and the symptoms were noted in 8% of the patients in our study. The higher incidence of these symptoms may be due to higher number of falciparum cases in our study compared to other areas where vivax malaria was predominant. It also signifies that the number of complicated malaria cases were more in our area than in other studies. The other factor which could have lead to higher number of cases of complicated malaria is that ours was a referral centre to many rural hospitals around.

The number of patients presenting with altered sensorium was seen in 50% of the cases in a study conducted by **Malhotra et al**[4]. Where as in our study it was only 12%. The higher incidence in their study was due to the fact that their study was conducted in patients with complicated malaria only. The incidence of altered sensorium was 14.8% with falciparum infection and 40% with mixed infection in our study.

Pallor was present in 75% of the patients in a study carried out by **Malhotra et al**[4] it was noted in 74% in our study. The incidence of pallor was more in patients with falciparum and mixed infection, it was 81.48% and 80% respectively. Pallor was present in only 61.1% of the patients with vivax malaria in our study. It correlates with study by **Sharma et al**[5]**.**

Icterus was noted in 16% of the patients in our study whereas it was seen in 25% of patients by **Malhotra et al**[4] and 46% of patients in a study by **Nand et al**[6]**.**

Splenomegaly was seen in 48% of the patients in our study similar rates were observed in a study by **Murthy et al** where the percentage of patients with splenomegaly was 50%[7]. High incidence of splenomegaly was noted in a study conducted by **Ram et al** the incidence was 88.75% in their study[8]. Comparatively high incidence of 60% was also observed by **Nand et al**[6]**.**

Hepatomegaly was noted in 16% of the patients in the present study. Studies by **Ram et al** and **Murthy et al** have shown an higher incidence of hepatomegaly in their work[7,8]. It might be due to the fact that their study mainly concentrated on the subjects such as malarial hepatitis and jaundice in malaria. The incidence in these studies was 79.5% and 91% in **Ram et al** and **Murthy et al** respectively whereas in another study by **Nand et al** the incidence was 13.3% which was comparable to our study.

Coma, Seizures or altered sensorium was observed among 12% of the patients in our study. It was noted that only patients with falciparum infection or mixed infection had these symptoms. It was not noted with any of the patients with vivax malaria. The study by **Malhotra et al** also had similar observation where the CNS involvement was noted in 12.5% of the patients this signifies that cerebral malaria can be caused only by pl.falciparum[1]. None of the patients with cerebral malaria had any residual neurological sequelae. **Newton C.R et al** in their study noted that approximately 3% of the patients with cerebral malaria had neurological deficit[9].

In the present study the percentage of falciparum malaria was 54% and the incidence of vivax and mixed infection was 36% and 10% respectively. In a study by **Rajansthein et al** the prevalence of falciparum was 76.2% whereas vivax malaria was just 23.8%[10]. In a study by **Reddy et al** there was high incidence of vivax malaria i.e 61.2% and falciparum being 36.8%[11]. In another study conducted by **Bhakshi et** al the incidence of falciparum, vivax and mixed infection was 60%, 35% and 5% respectively. This study by **Bhakshi et al** was similar to our study. From these observations we can conclude that the incidence of particular species varies with geographical area, the area where we have conducted the study is known to be endemic for falciparum and hence the higher incidence in my study.

Anaemia was present in 62% of patients in our study the incidence of severe anaemia(Hb <6gm%) was seen in 16% of the patients and it was comparable to study done by **Mehta et al** which had severe anaemia incidence of 18%[2]. The overall incidence of anaemia was higher in studies conducted by **Sharma et al** where the incidence was 86.7%[5]. The higher incidence could be explained by the fact that their study involved with cases of falciparum ma-

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laria only. If we consider only falciparum cases even our study showed an incidence of 74.07%. Also important to note that the mixed infection group also had an incidence of 80%.The incidence of anaemia in cases of vivax malaria was 38.3%.

Out of the 31 patients who had anaemia only 16 patients had splenomegaly this indicates that there are other factors other than splenic sequestration which could lead to anaemia.

Leukocyte Abnormalities:
Leucocytosis was seen in 12% of the total patients in our study. Similar observations were made in a study conducted by **Sharma S K et al** where the incidence of leucocytosis was 13.3%[5]. In our study 14.8% of the patients with falciparum malaria had leucocytosis and it was comparable to the study by **Sharma S K et al**. All the patients who had leucocytosis had neutrophilia which indicates superadded bacterial infection. In our study the mean leucocyte count was 6,753 cells per cubic millimetre. It indicates that majority of patients with normal leucocyte count.72% of the patients had leucocyte count within normal limits and similar results were observed by **Ladhani et al** in their study[12]. A study by **David Modiano et al** had an incidence of 15.4% cases with leucocytosis. Leucopenia was seen in 18% of the overall cases in our study. It was observed in 22.2% of the patients with falciparum malaria. **Sharma S K et al** in their study had observation that 6.6% of their patients had leucopenia. **Ladhani et al** in their study observed that 10.2% of the patients had leucopenia[12]. In a study by **S.Roy et al** 15% of the patients had leucopenia[13].

Monocytosis was observed in 16% of the patients in our study. It was observed by **N.K.D.Hakim et al** in their study that monocytosis in patients especially those on antimalarial therapy may be an indicative of an antimalarial effect by monocytes, thus monocytosis may enhance predisposition to a favourable outcome[14].

Eosiniophilia was observed in 4% of the cases in our study. Eosiniophilia was also noted in few cases in a study conducted by **Ladhani et al.**

Thrombocytopenia:
Thrombocytopenia was present in 68% of the cases in the present study. Thrombocytopenia was present in 70.3% of the cases with falciparum malaria in our study. In a study by **Horstmann et al** the incidence of thrombocytopenia was 85%[15]. **Sharma S K et al** observed that 70% of the patients had thrombocytopenia. **Kueh et al** had observed that 85% of the patients with falciparum malaria had thrombocytopenia[16]. In our study 66.6% of the patients with vivax malaria had thrombocytopenia. It was comparable to the study by **Horstmann et al** where the incidence of thrombocytopenia in vivax malaria was 72%. In our study 66.6% of the patients with mixed infection had thrombocytopenia. There are no studies which have mentioned the percentage of thrombocytopenia in mixed infection cases.

In our study only 18 patients out of 34 had splenomegaly. It can be observed that only 52.9% of the patients with thrombocytopenia had splenomegaly. So hereby we can conclude that splenic sequestration is not only the cause of thrombocytopenia other causes such as immune mediated platelet destruction also play a role.

In our study there was no difference between the percentage of cases of thrombocytopenia with falciparum and vivax malaria. Similar results were observed by **S Looreesuwan et al** in their study[17].

Heamotocrit:
Packed cell volume was decreased in about 86% of patients in our study. PCV was decreased in 88.8% of the patients with falciparum malaria this could be due to the decreased red cell mass in cases of falciparum. Haemtocrit of less than 20 was seen in 14% of the patients. The percentage of patients with PCV <20 was 18.5% among falciparum malaria 20% with mixed infection, this indicates the degree of anaemia and its higher rate of destruction associated with falciparum malaria.

Erythrocyte sedimentation rate:
Increased ESR was seen in 60% of the patients in our study. In the patients with falciparum malaria elevated ESR was seen in 74.07% cases. This was comparable to the study by **Bakshi et al** who had an incidence of 75% cases with elevated ESR in their study of falciparum cases it signifies exaggerated immune response which occurs with severe disease.

Coagulation:
prothrombin time: it was increased in 22% of the total cases and it was increased in 25.9% of cases with falciparum malaria. It was increased in 16.66% and 20% of the patients with vivax and mixed infection. In a study conducted by **S.Roy et al**[13] PT was increased in 11.6% of cases. In a study of severe falciparum malaria cases by **R.Clemens et al**[18] PT was prolonged in 22.7% of the cases this was similar to the observations in our study.

Activated partial thromboplastin time: In our study APTT was found to be increased in 14% of the patients. It was increased in 14.8% of the cases with falciparum malaria and 5.5% of cases with vivax malaria and 40% with mixed infection.

In a study conducted by **S.Roy et al** APTT was increased in 16.6% of the patients this was similar to what we observed in our study.

Bleeding time: In our study 3 patients had increase in bleeding time all the cases were falciparum and mixed infection. 2 out of these 3 patients had bleeding manifestations. In a study by **Sharma et al** 6.7% of patients had increased bleeding time. In a study by **S Roy et al** on falciparum malaria cases 5% of the patients had increased bleeding time. Our observations were comparable to both these studies.

Peripheral blood smear: In our study 58% of the patients had normocytic normochromic blood picture. It was comparable to a study by **Sen et al**[19] where half the patients had normocytic normochromic blood picture. In our study 24% of the patients had microcytic hypochromic blood picture. This could be due to the prevalence of iron deficiency anaemia in our country. **Sen et al**[19] in their study also had microcytic hypochromic picture in 20% of cases.

In our study prevalence of dimorphic anaemia was seen in 18% of the cases similar results were also observed by **Sen et al** where the prevalence of dimorphic anaemia was 20% in their study.

Bone marrow changes: Bone marrow was normo cellular in 4 patients and hyper cellular with erythroid hyperplasia in

Volume : 5 | Issue : 12 | December 2015 | ISSN - 2249-555X

1 patient. In the 1 patient the erythroid, myeloid ratio was reversed. In a study of bone marrow in malaria **Wheatherall et al**[20] 68% of the patients showed normocellular and 18% showed hyper cellular bone marrow. These results were comparable to our study.

CONCLUSION

- The malaria incidence is higher in males than females with peak incidence in 3rd and 4th decade.
- Fever is the presenting complaint in almost all the cases.
- Easy fatigability indicates severe anaemia in malaria.
- Splenomegaly is an important sign in malaria, but absence of this does not rule out malaria.
- Anaemia is the most common haematological abnormality.
- Thrombocytopenia is very common in malaria, but spontaneous bleeding is rare.
- The higher incidence of falciparum in this study is due to the fact that ours is a tertiary centre.
- PT and aPTT were prolonged in some cases, predominantly in falciparum and mixed infections, but this does not result in spontaneous bleeding.
- BT was prolonged in 6% of the cases, most of them had spontaneous bleeding. It is also indicator of poor prognosis.
- Severe anaemia is poor prognostic factor and it increased the duration of hospital stay and even mortality.
- Mixed infections behave like falciparum malaria.

TABLES AND FIGURES

Male	Female	Total
33	17	50

Table 1:showing number of males and females distribution

Age group (years)	Number	Percentage
20-30	21	42%
31-40	16	32%
41-50	7	14%
51-60	5	10%
> 60	1	2%

Table 2 showing age distribution

Area	Male	Female	Total
Urban	11	5	16
Rural	22	12	34

Table 3 showing urban and rural distribution

Symptoms	Pl.falciparum (%)	Pl.vivax (%)	Total(%)
Fever	96.3	94.4	96
Chills and rigors	77.8	72.2	78
Easy fatiguability	33.3	22.22	28
Nausea and vomiting	44.44	44.44	48
Cough	7.4	5.5	8
Altered sensorium	14.8	0	12

Table 4 Showing incidence of symptoms

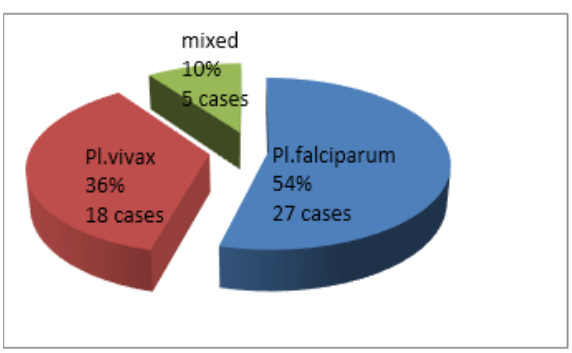
	Pallor	Spleenomegaly	Hepatomegaly	Icterus	CNS involvement	Pedal edema
Pt. with falciparum	81.48%	59.25%	22.22%	25.9%	18.5%	14.8%
Pt. with vivax	61.1%	22.22%	5.5%	0	0	5.5%
Mixed infection	80%	80%	20%	20%	20%	20%
Total	74%	48%	16%	16%	12%	12%

Table 5 Showing incidence of signs in different species of malaria

Anaemia	Spleenomegaly		Total
	Present	Absent	
Present	16	15	31
Absent	8	11	19
Total	24	26	59

Table 6 Association of anaemia and splenomegaly

Fig No.1 Diagram showing incidence of different species of malaria



Thrombocytopenia	Spleenomegaly		Total
	Present	absent	
Present	18	16	34
Absent	6	10	16
Total	24	26	50

Table 7 Association of thrombocytopenia and splenomegaly

	Falciparum	Vivax	Mixed	Total
Lymphocytosis	12(44.4%)	6(33.3%)	1(20%)	18(36%)
Lymphopenia	5(18.5%)	0	1(20%)	6(12%)
Neutrophilia	7(25.9%)	3(16.6%)	1(20%)	11(22%)
Neutropenia	6(22.2%)	2(11.1%)	0	8(16%)
Eosinophilia	0	2(11.1%)	1(20%)	3(6%)
Monocytosis	4(14.8%)	3(16.6%)	0	7(14%)

Table 8 Showing WBC abnormalities in malaria

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