Study of Clinical and Hematological Profile in Smear Positive Malaria Patients

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Abstract

Introduction

Malaria is a major health problem in many parts of India. Several factorshave been attributed to increased morbidity and mortality in malaria with altered hematological parameters playing an important role.

Objective

The hematological changes usually associated with malaria are well known. This study was conducted to estimate and compare the predominance & severity of hematological changes in common types of malaria and their clinical correlation.

Method

All patients who presented to Department of Medicine and proved to be malarial parasite positive through peripheral blood smear or antigen detection method were included in the study and underwent detailed clinical history, thorough clinical examination and investigated with hematological parameter.

Results

Total 200 patients were enrolled in the study. Out of 200 patient 143 (71.5%) had vivax malaria, 48(24%) had falciparum malaria and only 9(4.5%) cases with mixed infection. Anemia was seen in 163 cases (81.5%) of patients and Thrombocytopenia was seen in 175 cases (87.5%), Leucopenia was seen in 51(25.1%) cases. Fevers, chills, sweating were leading clinical presentation in all three forms. Splenomegaly was leading sign in all forms, mainly in falciprum malaria. Anemia and thrombocytopenia were more common in plasmodium falciparum and mixed infections as compared to plasmodium vivax.

Conclusion

Malaria must be considered as a leading differential diagnosis in acute febrile patients with more abnormalities like splenomegaly, fall in Hemoglobin level, low platelet count. It is suggested that the index of suspicion for malaria should be kept high in patients presenting with fever associated Anemia and thrombocytopenia.

Key Words: Malaria, Anemia, Thrombocytopenia

Introduction

Malaria is a major health problem in India and many parts of the world. According to world malaria report 2013 there were 207 million cases of malaria in 2012

resulting in 627000 deaths. 13% of these cases were reported from South East Asia, 52% of which were reported from India. India contributed 1.04 million of malaria cases leading to 504 deaths.[1] Malaria is a protozoan disease caused by Plasmodium species (P. falciparum, P. Vivax, P.ovale, P. malaria, P. knowlesi) which s transmitted by the bite of infected female Anopheles mosquitoes occurs through the tropics and sub tropics at altitudes below 1500 metres [2]. It is found all over the world from 40 degree south to 60 degree north [3]. In the last few decades efforts has been made to produce an effective malarial vaccine. These are still at developmental stages [4]. Even with all these efforts the malaria affects almost all the organs of the body. But one of the chief components affected is blood. So, this work puts in an effort to correlate the changes in blood.

Aims and Objective

1. To study clinical profile of malaria patients
2. To study hematological parameters in malaria patients and its correlation with clinical presentation and type of malaria parasite.

Material And Methods

All patients who presented to Department of Medicine in 2 year study period and proved to be malarial parasite positive through peripheral blood smear or antigen detection method were included in the study after considering inclusion and exclusion criteria.

Inclusion Criteria

- Clinically suspected cases positive for malaria parasite by antigen detection or peripheral smear.

Exclusion Criteria

- Clinically suspected cases negative for malaria parasite by peripheral smear.

- Patients having other co-infections like enteric fever, dengue fever, sepsis, UTI, meningitis, encephalitis etc. will be excluded from study.
- Pregnant female with malaria will be excluded from study.

The study was done after obtaining a detailed history, complete general physical examination and systemic examination. The patients were subjected to relevant investigations like Hemogram - Hb, total leukocyte count, differential leukocyte count, platelet count. All patients were subjected to peripheral smear examination - thick and thin smear for diagnosis of malaria. Two slides were prepared from each sample, one slide with a thick block film and another with a thin blood film and stained with Leishmann's stain. The species and the stage of the parasite were reported after examining the thin blood smear. The data regarding patient particulars, diagnosis and investigations is collected in a specially designed case recording form and transferred to a master chart subjected to statistical methods like mean, standard deviation, proportion and percentage calculation were used.

Results

Total 200 patients were enrolled in the study. Out of total 200 patients, 143 (i.e. 71.5%) were having P. vivax, 48 (i.e. 24%) had P. falciparum while 9 (i.e. 4.5%) had Mix - P. vivax and P. falciparum infection. Total 127 (i.e. 63.5%) were male patients and 73 (i.e. 36.5%) were female patients. Of all the male patients 93 (i.e.73.22%) had P. vivax, 30 (i.e. 23.62%) had P. falciparum and 6 (i.e. 4.7%) had mix infection. While in female patients 52 (i.e. 71.23%) had P. vivax, 18 (i.e.24.65%) had P. falciparum and 3 (i.e. 4.1%) had mix infection. As per the results incidence of both P. vivax and P. falciparum is marginally higher for male patients suffering with malaria compared to female patients with malaria.

As mentioned in Table 1, Fever was present in all the patients, mean duration of fever was 5.17 days (SD ±3.29) ranging from 1 day to 15 days. Of all the associated complaints most common were chills and rigor in 175 (i.e. 87.5%) patients and sweating in 35 (i.e. 17.5%) patients.

Other complaints were vomiting in 19 (i.e. 9.5%) patients, Abdominal pain in 21(i.e. 10.5%) patients, difficulty breathing in 2 (i.e. 1%) patients, cough in 8 (i.e. 4%) patients, headache in 18 (9%), altered sensorium in 6 (3%) patients

Table no 1: Presenting Clinical symptoms in different malaria infection

Clinical symptoms	Diagnosis						Total	Percent
	PV		PF		Mixed			
	No.	%	No.	%	No.	%		
Fever	143	40.17	48	35.56	9	34.62	200	100%
Chills & Rigor	118	33.15	48	35.56	9	34.62	175	87.5%
Sweating	47	13.20	19	14.07	4	15.38	70	35%
Vomiting	13	3.65	4	2.96	2	7.69	19	9.5%
Abdominal pain	14	3.93	5	3.70	2	7.69	21	10.5%
Cough	5	1.40	3	2.22	0	0.00	8	4%
Difficulty in breathing	2	0.56	0	0.00	0	0.00	2	1%
Headache	14	3.93	4	2.96	0	0.00	18	9%
Altered sensorium	2	0.00	4	2.96	0	0.00	6	3%

In general examination findings, pallor was present as most common finding in 163 (i.e. 81.5%) of patients. while icterus was present in 37 (i.e. 18.5%) of patients. Of all the systemic examination findings, hepatomegaly, splenomegaly was more consistently present compared to other systemic examination findings. Hepatomegaly was present in 31 (i.e. 15.5%) patients, splenomegaly was present in 46 (i.e. 23%) patients. And on CNS examination altered sensorium was present in 6 (i.e. 3%) patients.

Table no 2: Examination distribution in various species of malaria

Signs	Diagnosis						Total	Percent
	PV		PF		Mixed			
	No.	%	No.	%	No.	%		
Pallor	117	61.26	39	53.42	7	46.67	163	81.5%
Icterus	26	13.61	8	10.96	3	20.00	37	18.5%
Pedal Oedema	5	0.00	2	0.00	0	0.00	7	3.5%
Clubbing	2	1.05	0	0.00	0	0.00	2	1%
Hepatomegaly	18	9.42	11	15.07	2	13.33	31	15.5%
Splenomegaly	28	14.66	15	20.55	3	20.00	46	23%

Mean value of Hb was 10.79 ± 2.69 g/dl).Mean platelet count was 79442.45 ± 63605.91/μl. Mean leukocyte count was 6003.17(3080.02)/μl.

As shown in table no 3, majority of patients (41%) had mild degree (Hb 8-11g/dl) of anemia while moderate degree (Hb 5-8g/dl) of anemia seen in 35.5% cases. Severe anemia (Hb concentration <5g/dl) seen in 10% cases, mainly in falciparum infection i.e. 14.58% followed by mixed infection i.e.11.11%.

In malaria, majority of patients 140 (i.e. 70%) had normal WBC count (4000-11000/cumm). Reduction in WBC count (<4000/cumm) seen in 25.5% cases, mainly in falciparum infection i.e. 27.08%. Only 4.5% patients showed increase in WBC count (>11000/cumm).

In malaria, decreased platelet count was a constant feature seen in 175 (i.e.87.5%) cases showing platelet less than 1.5 lacs. Severe platelet reduction (<50000) was seen in 46 (i.e. 23%) cases of malaria, mainly in mixed infection i.e.33.33% followed by falciparum infection i.e. 25%.

Table no 3: Hematological parameter in different infections of malaria

	Diagnosis						Total	Percent
	PV		PF		MIXED			
	No.	%	No.	%	No.	%		
Hb conc. g/dl								
<5	12	8.39	7	14.58	1	11.11	20	10%
5-8	50	34.97	17	35.42	4	44.44	71	35.5%
8-11	61	42.66	18	37.50	3	33.33	82	41%
>11	20	13.99	6	12.50	1	11.11	27	13.5%
Total leucocyte count per cumm								
<40000	36	25.17	13	27.08	2	22.22	51	25.5%
4000-11000	101	70.63	32	66.67	7	77.78	140	70%
>11000	6	4.2	3	6.25	0	00	9	4.5%
Platelet count per cumm								
<50000	31	21.68	12	25	3	33.33	46	23%
50000-150000	93	65.03	30	62.5	6	66.67	129	64.5%
>150000	19	13.29	6	12.5	0	0	25	12.5%

In our study most of the patients (61.5%) show normal differential count. Neutrophillia was observed in 19 (9.5%) cases of malaria. Neutropenia and lymphocytosis observed in 12(6%) and 27(13.5%) cases of malaria infection respectively. Eosinophillia and monocytosis observed mainly in falciparum infection seen in 6.25% and 14.58% cases respectively.

Table no 4: Absolute count in various infection of malaria

Count	Diagnosis						Total	Percent
	PV		PF		Mixed			
	No.	%	No.	%	No.	%		
Neutrophillia	10	6.99	6	12.50	3	33.33	19	9.5%
Neutropenia	8	5.59	3	6.25	1	11.11	12	6%
Lymphocytosis	21	14.69	4	8.33	2	22.22	27	13.5%
Monocytosis	7	4.90	7	14.58	0	0.00	14	7%
Eosinophillia	2	1.40	3	6.25	0	0.00	5	2.5%
Normal counts	95	66.43	25	52.08	3	33.33	123	61.5%

Discussion

Malaria transmitted by the female anopheles mosquito causes clinical illness and pathological changes in various body organs with the parasites invading and multiplying in the circulating red blood cells. Prompt and accurate diagnosis in malaria is the key to effective malaria management. Clinical diagnosis is the most widely used approach for diagnosis of malaria in tropics, is unreliable because clinical presentation of malaria is diverse. Microscopic diagnosis, the established method of laboratory confirmation for malaria, requires technical expertise and repeated smear examinations. It is valuable technique when performed correctly but unreliable, time consuming and wasteful when poorly executed[5].

Malaria causes numerous hematological alterations of which anemia and thrombocytopenia are the most important.

This study was conducted on patients of malaria at S.P. Medical College and Associated groups of hospitals, Bikaner, during study period from September 2016 to September 2018 fulfilling the inclusion and exclusion criteria have been enrolled. A total 200 cases were positive for the malaria parasite by PBF and/or Rapid malaria test out of which 143 for P.vivax, 48 for P.falciparum and 9 cases of mixed infection. Similar studies conducted by Rajesh deshwal et al[6] and revealed higher P.Vivax prevalence similarly. The predominance of P.vivax cases can be explained by the fact that P.falciparum may present in severe form with number of

complications, so few of the patients may have died before being brought to tertiary care centre.

The present study had total 63.5% males, 36.5% females. Similar results in study conducted by Gupta BK et al[7] with 66.67% males and 33.33% female, and Rajesh deshwal et al[6] with 79% males and 21% females.

The mean age group of the present study was 33.68 years. The young age group is more affected due to their greater mobility and greater risk of exposure due to more outdoor activity.

Fever was the hallmark of the disease and present in all cases positive for malaria parasite. Fever with chills and Rigor were found in 87.5% cases. Gaurav et al[8] observed that fever was present in all cases of P.vivax and P.falciparum. Rajesh Deshwal et al[6] reported chills and rigor in 84% and Gaurav et al[8] in 69% cases with malaria due to stimulation of autonomic system. Gastrointestinal symptom such as vomiting was present in 9.5% cases in our study. Rajesh Deshwal et al[6] reported vomiting in 12.5% cases of malaria.

In the present study severe complication like altered sensorium, CNS dysfunction was present in 3% cases and most of them were infected with P. falciparum.

Among general examination, pallor most common finding reported in 81.5% cases in our study. Similar results obtained in study by Gaurav et al[8]. In all systemic examination finding, splenomegaly was most frequent finding reported in 23% in present study. Rajesh Deshwal et al[6] observed that splenomegaly was present in 24.84% cases respectively.

Anemia is a frequent finding in malaria cases, particularly in developing nations. The pathogenesis of anemia is multifactorial. There is destruction of RBC's containing parasites, accelerated destruction of non-parasitized RBC's

that parallels disease severity and there is bone marrow dyserythropoiesis.

In the present study anemia (Hb <11gm/dl) was seen in 86.5% patients. Studies conducted by Chandra and Chandra et al[9], Nutan et al[10] had anaemia in 81.2%, 75% of the cases respectively. Severe anemia (<5gm/dl) was seen in 10% cases of total patients. The other studies conducted by Nutan et al[10], Mohan et al[11] showed severe anemia in 31.5%, 14% and of cases respectively.

In our study leucocytosis was seen in 4.5% cases, in P.vivax infection was seen in 4.20% cases while in P. falciparum infection it was observed in 6.25% cases. The increase in number of cases of leucocytosis in malaria was usually due to secondary bacterial infections.

Leucopenia was seen in 25.5% of total cases in present study. In case of vivax, 25.17% of cases showed fall in leucocytes while in falciparum 27.08% cases showed leucopenia. Bashwari et al[12] and Nutan et al[10] observed leucopenia in 13.3% and 26.5% cases respectively. Leucopenia is thought to be due to localization of leucocytes away from the peripheral circulation, splenic sequestration and other marginal pools rather than actual depletion or stasis.

The present study showed increased neutrophillia in 9.5% cases and neutropenia in 6% cases. The findings were in corroboration with the study carried out by Shamim Akhtar et al[13]. Lymphocytosis was seen in 13.5% of the cases in the present study similarly Bashwari et al[12] reported lymphocytosis in 13.6% cases. Eosinophillia was seen in the present study in 2.5% cases. Similar finding was reported by Biswas et al[14] in 3% cases. Monocytosis was seen in the present study in 7% cases. Consistent finding (7%) was reported by Bashwari et al[12].

Thrombocytopenia is the most common finding, irrespective of the type of malaria. In the present study

thrombocytopenia (<1.5 lacs) seen in 86.7% of P.vivax and 87.5% of P.falciparum malaria. These findings were consistent with the findings of Shamim Akhtar et al[13] which revealed thrombocytopenia more frequently in falciparum malaria in 79.48% cases. Presence of thrombocytopenia in a patient of acute febrile illness in the tropics increases the probability of malaria and can be helpful clinical indicator for starting therapy.. The various mechanism causing thrombocytopenia in malaria are immune mediated lyses, sequestration in spleen and a dyspoietic process in the marrow with diminished platelet production, shortened life span of platelets and antiplatelet antibodies have also been implicated.

Conclusion

Malaria is the most common disorder in this country presenting with febrile illness and varied clinical manifestations. Malaria has a significant impact on Hematological profile, most marked being thrombocytopenia and anemia. Clinical presentation of various plasmodium species is almost similar with few differences. Malaria must be considered as a leading differential diagnosis in acute febrile patients with more abnormalities like splenomegaly, fall in hemoglobin level, platelet count. Patients with acute febrile illness having combination of thrombocytopenia and anemia should alert the treating physician about the possibility of malaria infection which can be confirmed with specific tests. Peripheral smear study is the gold standard investigation for identification of different forms of parasites.

References

1. World Malaria Report,Geneva Switzerland: WHO Press;2009

2. WHO, WHO Expert committee on Malaria Twentieth report. 1998. Geneva. Switzerland 2000

3. Murray CJL, Lopez AD; Evidence based health policy – Lessons from the Global Burden of Disease Study Science 1996; 274:740-743.

4. Park K; Malaria Text book of preventive and social medicine. 17thEdn. Page 192-201

5. WHO New perspective: Malaria diagnosis: Report of a joint WHO/USAID Informal Consultation,Geneva, Switzerland; 4-5,1999.

6. Rajesh Deshwal**.** Clinical and Laboratory Profile of Hospitalized Malarial Patients: An Agra-Based Study **.**journal of association of physicians of india. 2016. Vol 64

7. Gupta BK, Nayak KC, Kumar S, Kumar S, Gupta A, Prakash P. Oliguric and non-oliguric acute renal failure in malaria in the west zone of rajasthan, India-A comparative study. J Acute Dis. 2012; 1: 100-106

8. Gaurav I. Patel, Prasad Muley, Abhishek Vadher et al. A comparative study of clinical, biochemical and hematological profiles in smear positive malaria patients: at a tertiary care center located in rural part of Gujarat, India**.** International Journal of Research in Medical Sciences *2015 Oct;3(10):2561-2566.*

9. Chandra S and Chandra H: Role of hematological Parameters as an indicator of Acute Malarial Infection in Uttarakhand State of India. Mediterr J Hematol Infect Dis 5(1); 1-7, 2013

10. Nutan Agrawal, Kshitiz Nath, Kuldeep Chandel. Hematological changes in malaria. J of Evolution of Med and Dent Sci/ eISSN- 2278-4802, pISSN- 2278-4748, Vol. 4, Issue 65, Aug 13, 2015.

11. Dr. Mohan. Kashinkunti, Dr. Shruthi..Alevoor. Clinical, Hematological and Coagulation Proflile in Malaria. Scholars Journal of Applied Medical Sciences (SJAMS) 2014; 2(2B):584-588.

12. Bashwari LAM, Mandil AA, Bahnassy AA and Ahmed MA:Malaria; Hematological Aspects. Annals of Saudi Medicine 22(1); 372-7, 2002.

13. Dr Shamim Akhtar, Dr Raghvendra Gumashta, Dr Sadhana Mahore: Hematological changes in malaria: A comparative study. IOSR Journal of Pharmacy and Biological Sciences ISSN: 2278-3008 Volume 2, Issue 4, PP 15-19

14. Biswas R, Sengupta G and Mundle M: A Controlled Study on Hemograms of Malaria Patients in Calcutta. Indian J Malariol 36(1); 42-8, 1999.