ORIGINAL ARTICLE

SPECTRUM OF CLINICAL AND HAEMATOLOGICAL FINDINGS IN MALARIA

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ABSTRACT

Background: Malaria is commonly associated with various clinical and haematological findings. The study was conducted to evaluate clinical and haematological findings in common types of malaria.

Material & Methods: This descriptive study was conducted in Combined Military Hospital, Dera Ismail Khan, from August 2013 to December 2013. A total of 200 malaria patients confirmed on microscopy of Leishman stained peripheral blood films were included in the study. Complete blood count was carried out using Sysmex KX-21 automated hematology analyzer and thin blood smears were used for microscopy. The research variables were clinical and hematological findings. Data were analyzed by using statistical package for social sciences (SPSS) version 17.0.

Results: Fever was present in all patients, associated with rigors and chills in 143(71.5%) patients and spleen was palpable in 139(69.5%) patients. P. vivax was found in 162(81%) and P. falciparum in 38(19%) patients. Anaemia was associated more with P. falciparum malaria where it was found in 77.8% patients in contrast to 47.3% with P. vivax where it was found in 45.1% patients while 16.7% patients with P. falciparum malaria were lymphocytopenic (p=0.02). Thrombocytopenia was present in 176 (88%) patients without statistically significant difference between the two species.

Conclusion: Fever with rigors, chills and splenomegaly are the main clinical feature. While anaemia, thrombocytopenia and lymphocytopenia are major haematological features in malaria.

KEY WORDS: Malaria; Fever; Anaemia; Thrombocytopenia; Lymphocytopenia.

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INTRODUCTION

Malaria is a protozoan infection caused by five species of Plasmodium (P.) in humans; P. falciparum, P. vivax, P. ovale, P. malariae and P. knowlesi.[1,2] Plasmodium is transmitted through bite of infected female Anopheles mosquito but can be transmitted by transfusion, bone marrow transplantation and transplacentally.[1] Severe malaria is largely caused by P. falciparum infection while the disease caused by other species is usually mild and rarely fatal.[3] Serious life threatening complications can occur with multiple organ involvement in P. falciparum infection.[1]

According to World Health Organization (WHO), 207 million cases of malaria occurred worldwide in 2012 resulting in 627,000 deaths, 77% of which were children under 5 years of age.[4] Half of the World's population is at risk of malaria transmission in tropical and sub tropical regions of Africa, Asia and America.[5] Pakistan is one of malaria endemic countries according to WHO where 29% of the population lives in areas of high malaria transmission. Around 285,000 confirmed malaria cases were reported in Pakistan in 2013 leading to 260 deaths.[4] Most of the cases of malaria are reported from provinces of Baluchistan and Sind.[6]

Malaria is characterized by intermittent high grade fever, headache, excessive sweating, nausea and vomiting, flu like symptoms, jaundice, pallor, splenomegaly and hepatomegaly. The hematological changes associated with malaria include anaemia and thrombocytopenia; however lymphocytopenia, leucopenia, leukocytosis, neutropenia and neutrophilia have also been reported in literature.[7] This study was conducted to determine the clinical and haematological features associated with malaria, and their association with either of the species of Plasmodium.

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MATERIAL AND METHODS

This study was conducted at the Departments of Pathology and Medicine, Combined Military Hospital, Dera Ismail Khan from August to December 2013. A total of 200 febrile patients were included in the study. These individuals were confirmed to be infected with malaria on basis of positive microscopy of Leishman stained peripheral blood films. All febrile patients with negative blood films were excluded from the study.

An informed consent was obtained from each subject. Detailed history was taken from every patient that included character of fever and its association with rigors and chills, presence of flu like symptoms, headache, nausea and vomiting, fits, features of renal failure (hypertension, oedema, anuria and oliguria) and hypoglycemia (confusion, personality changes, fits and unconsciousness). All patients were examined clinically for hypertension, oedema, splenomegaly and hepatomegaly. Blood glucose level was checked with glucometer at the bedside while serum urea and creatinine were carried out to assess renal status.

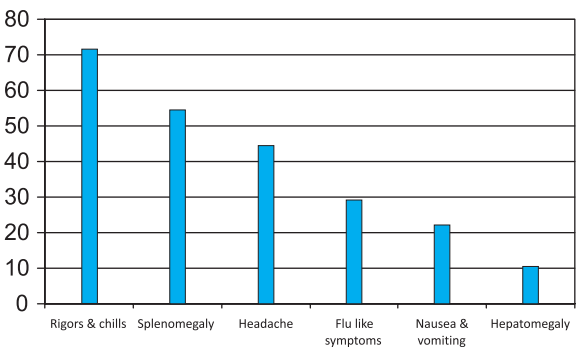

Figure 1: Frequency of clinical features in malaria.

Table 1: Distribution of platelet count.

Platelet count ($x10^9$/l)	Number of patients	Percentage of patients
150–400	25	12.5%
100–149	39	19.5%
50–99	91	45.5%
<50	45	22.5%

After reassuring the patient, 3 ml of venous blood was drawn from antecubital vein in EDTA. Blood counts were performed by Sysmex KX-21 automated hematology analyzer. Blood samples were used for preparing thin blood smears that were stained with Leishman stain. Differential leucocyte count (DLC) was performed and slide was examined for malarial parasite (MP). At least 200 fields on oil immersion lens were examined before declaring a slide negative for MP. Absolute neutrophil count (ANC) and absolute lymphocyte count (ALC) were calculated by multiplying percentage of respective DLC with total leucocyte count (TLC).

Data were analyzed by using statistical package for social sciences (SPSS) version 17.0. Mean, median and standard deviation (SD) were calculated for quantitative variables i.e. age, TLC, platelet count, haemoglobin (Hb), ANC and ALC. Published reference ranges were used for blood counts according to age and gender.[8] Frequency and percentage was calculated for gender, species of Plasmodium and clinical features.

RESULTS

A total of 200 febrile patients confirmed to be suffering from malaria on basis of positive microscopy of peripheral blood films were evaluated in the study. Out of the 200 subjects, 177 (88.5%) were males and 23(11.5%) were females. The mean age of the patients was 28.6 ± 10.4 (Mean ± SD) years. Their ages ranged from 2 to 80 years with a median age of 28 years. Majority of these patients (188) were > 12 years of age in comparison to 12 patients who were ≤ 12 years of age.

All the patients had fever that was associated with rigors and chills in 143 (71.5%) patients. Headache, flu like symptoms and nausea and/or vomiting were present in 89 (44.5%), 58 (29%) and 44 (22%)

Table 2: Haematological parameters according to *Plasmodium* species.

Species	P. vivax	P. falciparum	Total
Number of patients	162 (81%)	38 (19%)	200 (100%)
TLC x 10^9/l (mean ± SD)	5.2±1.8	5.8 ± 1.8	5.2 ± 1.8
ANC x 10^9/l (mean ± SD)	3.8 ± 1.5	3.4 ± 1.9	3.7 ± 1.5
ALC x 10^9/l (mean ± SD)	1.1 ± 0.6	2.1 ± 1.2	1.2 ± 0.8
Hb g/dl	M: 12.9 ± 1.7	M: 11.6 ± 2.4	M: 12.7 ± 1.6
(mean ± SD)	F: 10.6 ± 1.6	F: 10.3 ± 1.3	F: 10.5 ± 1.5
Platelet count x 10^9/l (mean±SD)	84 ± 46	103 ± 65	86 ± 48

ALC = Absolute lymphocyte count, ANC= Absolute neutrophil count, TLC = Total leucocyte count.

patients respectively. None of the patients had history of fits neither did any patient have hypoglycemia or deranged renal functions. Spleen and liver were palpable in 109 (54.5%) and 11 (6.5%) patients respectively (Figure 1).

P. vivax was found in 162 (81%) patients in contrast to 38 (19%) patients with P. falciparum malaria. P. ovale and P. malariae were not detected in any sample. Half of the patients (50%) presented with anaemia and half (50%) had normal Hb. Anaemia was associated more with P. falciparum malaria where it was found in 77.8% patients in contrast to 47.3% patients with P. vivax malaria (p=0.01). Thrombocytopenia was found in 176 (88%) patients. Majority of the patients with thrombocytopenia (45.7%) had platelet count between 50 and 99 x 109/l. (Table 1). None of the patient had platelet count below critical value of 10 x 109/l. There was no significant difference in thrombocytopenia associated with P. vivax (88.5%) and P. falciparum (83.3%) malaria (p > 0.05).

Majority of the patients (73%) had TLC within reference range while 52 (26%) and 2 (1%) patients had leucopenia and leucocytosis respectively. Normal ANC was found in 171 (85.5%) patients while 22 (11%) patients had neutropenia. Lymphocytopenia was found in 85 (42.5%) patients whereas 108 (54%) patients had normal ALC. Lymphocytopenia was associated more with P. vivax malaria where 45.1% patients had lymphocytopenia in contrast to 16.7% patients with P. falciparum malaria (p = 0.02). Comparative blood counts according to MP species are shown in Table 2.

DISCUSSION

There was male predominance in our study population that could be an incidental finding due to increased vulnerability of males to mosquito bites because of their outdoor activities. Females, on the other hand, are not only better covered up to escape mosquito bites but there are fewer opportunities for them to seek medical advice in our country. The age of malaria positive subjects ranged between 2 and 80 years depicting susceptibility of all age groups to malaria infection.

P. vivax was found to be the predominant species followed by P. falciparum. Most of the local studies confirm predominance of P. vivax but prevalence of P. falciparum detected in our study i.e. 19% was lower than that in other local studies.[9,10] Fever with or without rigors and chills, flu like symptoms, headache, nausea and/or vomiting, splenomegaly and hepatomegaly were chief clinical features in our subjects. These features have previously been reported in literature with varied percentages.[11,12]

Anaemia is one of the major haematological manifestations of malaria and its cause is multifactorial. The causes of anaemia in malaria include increased destruction of infected as well as uninfected RBCs by reticuloendothelial system, dyserythropoiesis in bone marrow, depressed reticulocytes response in acute malaria, hypersplenism and folate deficiency.[13] In our study, 100 (50%) patients presented with anaemia that is comparable to study by Bashawri et al that reported anaemia in 59% patients of malaria.[7] Anaemia was associated more with P. falciparum malaria where it was found in 77.8% patients in contrast to 47.3% patients with P. vivax malaria (p=0.01). The association of anaemia with P. falciparum malaria is established and has been reported in literature.[7,11]

Thrombocytopenia is the most frequent haematological abnormality encountered in malaria, and is postulated to be due to immune mediated lysis, sequestration in the spleen and decreased production in the bone marrow.[14] In our study, 176 (88%) patients had thrombocytopenia, that supports the observation by Jojera et al (89.2%), Haroon et al (87%) and Abro et al (83%).[11,15,16] But some studies have reported a lesser percentage of malaria patients presenting with thrombocytopenia.[17,18] Mean platelet count in P. vivax was lower than that in P. falciparum in our subjects that is comparable to observation by Taha et al[19] but a higher mean platelet count in P. vivax has also been reported.[17,20,21] There was no statistically significant difference in incidence of thrombocytopenia associated with P. vivax and P. falciparum in our study; an observation that has already been published.[15,18]

Majority of malaria patients are known to have TLC and ANC within reference range.[7,11,18,22] In current study, TLC and ANC was within reference range in 73% and 85.5% patients respectively while lymphocytopenia was found in 42.5% patients. Although association of lymphocytopenia with P. falciparum has been reported,[15,18] this study showed statistically significant difference between incidence of lymphocytopenia associated with P. vivax (45.1% patients) and P. falciparum (16.7% patients) malaria (p=0.02) in concordance with finding by Abro et al.[16]

CONCLUSION

Fever with rigors, chills and splenomegaly are the main clinical feature. While anaemia, thrombocytopenia and lymphocytopenia are major haematological features in malaria.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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None declared.