INTRODUCTION

Malaria is a life threatening infectious disease and in severe cases it is associated with calamitous complications and far-reaching consequences within a community. It is estimated that annual global incidence of malaria is 300-500 million cases and each year about 1-3 million deaths occur worldwide. In Pakistan, annual incidence of malaria is half a million cases and each year an estimated fifty thousand deaths occur mostly in infants, children and pregnant women. The disease is caused by infection with a parasitic unicellular organism of genus Plasmodium, that gets injected into the human bloodstream through a bite of female Anopheles mosquito. Traditionally four species of Plasmodium including P. falciparum, P. vivax, P. ovale and P. malariae have known to be causing infections in humans. However another species, P. knowlesi that causes malaria in macaques, have been reported to cause malaria in humans and since 2004, increasing data is being published with regards to an increase in its incidence in various Southeast-Asian countries. Plasmodium vivax is the most common human malaria parasite of the four species affecting humans. Currently, this infection is endemic in many countries of Asia, South Pacific, North Africa, Middle East and South and Central America. In Pakistan, Plasmodium vivax is the major parasite and accounts for 70% cases, during peak transmission periods; whereas Plasmodium falciparum is responsible for remaining 30% malaria cases. Though Malaria is endemic in this country, with the majority of cases caused by Plasmodium vivax; recently there has been an alarming shift to infection caused by Plasmodium falciparum, especially in the southern Punjab, Baluchistan and Sindh provinces.

The epidemiology of malaria varies considerably between countries and regions. Many factors influence the pattern of patients’ clinical manifestation such as endemicity of infection, geographical location, availability and accessibility to health care facilities, effectiveness of drugs, and age.

The most commonly described clinical presentation of P. vivax malaria is fever, headache, chills and sweating. However abdominal and osteomuscular pain, vomiting, diarrhea, hepatomegaly and splenomegaly have been reported. Symptoms and clinical signs of the infection caused by P. vivax resemble infection caused by other species and it is not possible to predict diagnosis of malaria or the infecting species involved, based on specific symptom.

There has been an increase in the number of reports of complications during P. vivax infection, including cerebral malaria and seizures, pulmonary
In view of paucity of data from Federally Administered Tribal Area (FATA), Khyber Agency, we have attempted to throw some light on the Clinical findings of patients suffering from malaria by clinically examining the patients and comparing them with the available literature worldwide.

**Material and Methods**

This descriptive cross-sectional study was conducted at a private clinic in Tehsil Bara Khyber Agency, FATA; Pakistan during the four and a half-year period from July 2009 to January 2014. This is a pediatric clinic which receives patients from across the Bara and suburbs of Khyber Agency cases were only included when age of patients was less than 15 years and malaria was confirmed clinically, with further confirmation through a laboratory test. Children with age more than 15 years, children with history of antimalarial drug intake in last 2 weeks including artem, quinine, amodiaquine, chloroquine and Artemisinin based combination therapy (ACT) and those with Cerebral malaria were excluded from the study.

One hundred and nineteen patients were selected who attended this clinic during the study period. Data was collected using pre-designed questionnaire. All patients included in the study were diagnosed clinically and were confirmed by doing Giemsa stained thick blood smears. Hemoglobin was also obtained for each patient at time of enrollment and was analyzed using WHO criteria. The information on child’s age, gender, history of high grade fever, chills, vomiting, abdominal pain, and low grade fever was obtained. Every patient was examined by consultant pediatrician and included assessment of the child’s body weight, axillary’s temperature, palmar and conjunctival pallor and spleen for splenomegaly. Informed verbal consent was obtained from the parents/guardian before data collection and examination of the patient.

All the data was analyzed using SPSS version 17.0. Non-parametric variables were analyzed using Chi-square test of independence (x2), whereas parametric variable was analyzed using Student’s T test. Results were considered statistically significant when p-value < 0.05, at 95% level of significance. Extensive literature search was done using PubMed database and Google Scholar, while references were cited using Endnote X1 library.

**Results**

A total of 119 malaria parasite (MP) positive patients were included in the study of which 79 (52.9%) were males and 40 (47.1%) were females with male to female ratio of 1.97:1. The mean age of patients was 5.62 ± 3.54 years (range 0.2-15 years). The average body weight of children was 17.5±8.4 kg (range 6-58 kg). Out of total 119 cases, 109 (91.6%) cases were positive for P. vivax malaria and 10 (8.4%) cases for P. falciparum malaria.

Main symptoms observed during the clinical disease are shown in Table 1. In females, high grade fever (100% vs. 97.5%) and chills (12.5% vs. 7.6%) were more frequent as compared to males. Whereas spleenomegaly was more frequent in males (15% vs. 7.5%) as compared to females.

In P. falciparum infection, high grade fever (100% vs. 98.2%) and chills (30% vs 7.3%) were more frequent as compared to P. vivax infection (P>0.05). Similarly spleenomegaly (50% vs. 9.2%) and pallor (100% vs. 96%) were more common findings in P. falciparum vs. P. vivax infection. However only spleenomegaly vary significantly across the malarial specie, P=0.001.

Using WHO criteria, Anemia was defined as Hb<13g/dL in males and Hb<12g/dL in females.100% males and 97.5% females were anemic. Mean Hb in was 10.1 g/dL in males and 9.67g/dL in females. However, Mean Hb did not vary significantly across gender, P=0.07, when analyzed using Student T test. Whereas, Mean Hb varied significantly across malaria specie, P=0.04, while using Student T test, where in Pfalciparum it was lower, 9.2g/dL, as compared to PVivax,10.05g/dL.

**Table 1: Frequencies of Clinical features and Anemia in Pediatric Malaria patients**

<table>
<thead>
<tr>
<th>Clinical Features &amp; Anemia</th>
<th>Frequencies</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>High grade Fever Present</td>
<td>117</td>
<td>98.3%</td>
</tr>
<tr>
<td>Absent</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Chill Present</td>
<td>11</td>
<td>9.2%</td>
</tr>
<tr>
<td>Absent</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>Vomiting Present</td>
<td>1</td>
<td>0.8%</td>
</tr>
<tr>
<td>Absent</td>
<td>118</td>
<td></td>
</tr>
<tr>
<td>Abdominal Pain Present</td>
<td>2</td>
<td>1.7%</td>
</tr>
<tr>
<td>Absent</td>
<td>117</td>
<td></td>
</tr>
<tr>
<td>Low grade fever Present</td>
<td>1</td>
<td>0.8%</td>
</tr>
<tr>
<td>Absent</td>
<td>118</td>
<td></td>
</tr>
<tr>
<td>Spleenomegaly Present</td>
<td>15</td>
<td>12.6%</td>
</tr>
<tr>
<td>Absent</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>Pallor Abnormal</td>
<td>115</td>
<td>96.6%</td>
</tr>
<tr>
<td>Normal</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Hemoglobin(g/dL) Abnormal</td>
<td>118</td>
<td>99.1%</td>
</tr>
<tr>
<td>Normal</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
DISCUSSION

In our study, majority of malaria positive patients were suffering from *P. vivax* malaria (91.6%) and only 8.6% were suffering from *P. falciparum* malaria. This high incidence of *P. vivax* was in accordance with other studies, reporting that, in Pakistan the major parasites are Plasmodium vivax, which accounts for 70% cases followed by Plasmodium falciparum which accounts for 30% cases. Similarly J Li et al reported that Plasmodium vivax is currently endemic in many countries of Asia, South Pacific, North Africa, Middle East and South and Central America. However, Khan MA et al and other researchers reported that although majority of cases are caused by Plasmodium vivax, there has recently been an alarming shift to infection caused by Plasmodium falciparum, especially in the southern Punjab, Baluchistan and Sindh provinces.

The most common symptom was high grade fever (98.3%) followed by chills (9.2%), Abdominal Pain (1.7%), Vomiting (0.8%) and low grade fever (0.8%). Finding of hi grade fever was comparable to other studies where it was present in 91% patients and in 97% patients.

On examination palmar and conjunctival pallor was present in 96.6% children and splenomegaly in 12.6% children. It was comparable to study done in Columbia where splenomegaly was present in 10% of malaria patients. While in Brazil, splenomegaly was detected in 46% of the children and in Surat-India 13% were having splenomegaly.

In this study, splenomegaly was present in 50% patients with *P. falciparum* malaria as compared to *P. vivax* (9.2%) with *p* = 0.001. This finding is comparable to a study in Shoklo-Thailand, where 25% of *P. falciparum* 8% and of *P. vivax* infected children had splenomegaly. Researcher from Karachi reported that splenomegaly were seen more frequently among patients with falciparum malaria compared to those infected with *P. vivax* (22.3% vs 12.2%).

Anemia in malaria is due to the destruction of infected erythrocytes and to bone marrow suppression. In our study 99.1% patients were anemic, with anemia being more common in males (100%), as compared to females (97.5%). Mean Hb in females (9.67 ± 1.38 g/dL) was lower than that in males (10.1 ± 1.17 g/dL) with *p* = 0.07. These results were in good agreement with studies from Columbia and Uganda, showing mean Hb in females was lower than that males in malaria patients. Also we found that Mean Hb in *P. falciparum* (9.2 ± 1.91 g/dL) was lower than that in *P. vivax* (10.05 ± 1.17 g/dL) and varied significantly across malaria specie *p* = 0.04. Again finding this was in agreement with study from Karachi showing that low hemoglobin levels were common and were significantly lower with *P. falciparum* as compared to *P. vivax*.

CONCLUSION

The most common symptoms of malaria regardless of the species involved are high grade fever and chills; and most common signs are pallor and spleenomegaly. We conclude that anemia and spleenomegaly are more common in *P. falciparum* malaria than *P. vivax* malaria.

REFERENCES


