

# FREQUENCY, SEASONAL VARIATION AND TREATMENT OUTCOME OF MALARIA IN PANJGUR, PAKISTAN

Sumera Akram<sup>1</sup>, Muhammad Ahmed Khan<sup>2</sup>, Hassan Bin Usman Shah<sup>3</sup>

<sup>1</sup>District Headquarters Hospital Zhub - Pakistan

<sup>2</sup>Combined Military Hospital Zhub - Pakistan

<sup>3</sup>Public Health Specialist, Department of Public Health, Doha - Qatar

**Address for correspondence:**

**Dr. Sumera Akram**

District Headquarters Hospital Zhub - Pakistan

E-mail: sumera\_ak@yahoo.com

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## ABSTRACT

**Objective:** To determine frequency, types, seasonal variation and treatment outcome of malaria in Panjgur, Pakistan.

**Methodology:** Total 815 cases of malaria, reported at Frontier Corps Medical Centre Panjgur, from January to December 2018 were included in this cross sectional study. Diagnosis of malaria was made on clinical symptoms and laboratory evidence of plasmodium parasite. Anti-malarials were administered according to the type of plasmodium. The data was entered and analyzed with SPSS version 20. Percentages were used to express frequencies. Chi square test was used to analyze qualitative variables. P value of  $\leq 0.05$  was considered significant.

**Results:** Age range of cases was from 2 to 63 years. Mean age was 24.89 + 11.08 years. There were 653 male cases (80.1%) and 162 females (19.9%). Out of 815, 653 (84.5%) were cases of vivax malaria, 87 (10.7%) falciparum malaria and 37 (4.5%) were mixed malaria (both vivax and falciparum). Majority of cases were admitted from March to August months. Out of total 691 cases of vivax malaria, 93.34% were sensitive and 6.66% were resistant to chloroquine. They were sensitive to Artemether plus lumefantrone.

**Conclusion:** Malaria is still a significant problem in remote areas of Pakistan. Vivax malaria is most common variety followed by falciparum and mixed malaria. Majority of cases were seen from March to August. Plasmodium vivax has good sensitivity to chloroquine but in few resistant cases combination of anti-malarial drugs has to be used for treatment.

**Key Words:** Frequency, Malaria, Seasonal variation, Plasmodium vivax, Plasmodium falciparum

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## INTRODUCTION

One of the most ancient known disease of mankind is malaria, an infectious disease transmitted by the bite of female anopheles mosquito, injecting mainly a parasite called plasmodium, of which most common are falciparum and vivax<sup>1,2</sup>. It is one of the most prevalent and fatal infectious disease around the world with an estimated 350-500 million clinical cases each year<sup>3</sup> having a death rate of around one million<sup>4</sup>. Children are more affected than adults<sup>5</sup>.

Malaria occurs predominantly among the poor socio-economic, intertwined communities, having low literacy rates and poor access to effective medicines<sup>6</sup>. Sub-Saharan Africa and South Asia are the two most malaria affected regions. Plasmodium falciparum is the main causative agent responsible for malarial transmission in Africa while plasmodium vivax is more prevalent in Indian sub-continent<sup>5,6</sup>. According to WHO classification,

Pakistan falls in countries with moderate to high malaria burden. Pakistan has a long history of controlling malaria. It became an active member of WHO's Global Roll Back Malaria (RBM) program in 1999 and a country wide RBM campaign was started in 2001<sup>7</sup>.

The prevalence of Malaria varies in different regions, mainly depending on the eco systems of that particular area. Pakistan has diverse cultures, low living standards, different seasons (especially hot and humid environment) and eco systems; all of which provide suitable conditions for mosquito breeding. Combating malaria in resource constraint areas is not an easy task. Proper identification of cases and its vector, detailed surveillance along with health-related literacy is important<sup>8,9</sup>.

Around 380 known species of Anopheles are present globally. However, in Pakistan, around 24 species have been reported. In Pakistan alone, around half million cases of malaria are reported each year. About fifty thousand deaths occur due to malaria annually, among

these, infants, pregnant women and children are most affected<sup>10</sup>.

Many studies have been carried out on malaria at regional and national level in Pakistan. However, Baluchistan, a malaria endemic region, has not been given much attention. This study was conducted in Panjgur, an area totally neglected especially in health care facilities to determine prevalence and transmission of malaria.

## METHODOLOGY

This cross sectional study was carried out in Panjgur, from January to December 2018. All the cases of malaria which reported at Frontier Corps Medical Centre Pangjur from January to December 2018 were included in the study. Clinical diagnosis of malaria was made on the presence of symptoms of fever, rigors, headache, anorexia, nausea, vomiting and malaise. All the cases were admitted and blood sample was drawn for microscopy and confirmation/detection of malarial parasite. Individuals of any age and gender with above symptoms whose blood sample microscopy confirmed presence of plasmodium vivax, Plasmodium falciparum, Plasmodium malarae or any combination of these were included. Individuals who were enrolled were residents of Panjgur and surroundings i.e. they had not recently migrated from other cities recently. Individuals who were taking any prophylactic anti-malarial drug or those suffering from chronic liver or renal disease, tuberculosis, epilepsy and immunosuppression, were excluded. Those with known hypersensitivity to anti-malarial drugs or those with complicated malaria requiring intravenous artesunate and high dependency care were immediately transferred to tertiary care centre.

Regular monitoring of body temperature and condition was carried out under supervision of trained nursing staff. Anti-malarial was started after receiving laboratory microscopy report. The cases whose blood

microscopy was negative for malarial parasite (even after repeating during febrile phase) were not included and were managed accordingly. All patients of vivax malaria were given chloroquine phosphate. Paracetamol was advised for fever. Cases resistant to or not responding to chloroquine phosphate for 48 hours were shifted to Artemether plus Lumefantrine combination. Patients were considered resistant in case fever did not settle or start declining in intensity after 48 hours of initiating chloroquine. Cases of falciparum malaria or mixed malaria i.e. harboring both plasmodium vivax and plasmodium falciparum were advised Artemether plus Lumefantrine. In case of vomiting immediately or within one hour after taking the dose, dose was repeated or given after administering intravenous antiemetic injection metoclopramide.

Data consisting of age, gender, number of diagnosed cases of malaria throughout the year (month wise), types of Plasmodium, efficacy of chloroquine phosphate for Plasmodium vivax, vivax malaria cases resistant to or not responding to chloroquine phosphate and efficacy of Artemether plus Lumefantrine was assessed. All the data was entered and analyzed by SPSS version 20 for descriptive statistics.

## RESULTS

The age range of cases was 2-63 years with mean age of 24.89 + 11.08. There were 653 male cases (80.1%) and 162 females (19.9%) as shown in table 1.

The type of malaria is shown in table 2.

Majority of the cases were admitted from March to August. Month wise distribution of different types of malaria cases is shown in table 3.

Treatment with different medications is shown in table 4.

**Table 1: Gender distribution**

Gender	Frequency	%age
Male	653	80.1%
Female	162	19.9%
Total	815	100%

**Table 2: Cases according to types of malaria**

Type of Malaria	Frequency	%age
Vivax Malaria	691	84.8%
Falciparum Malaria	87	10.7%
Mixed Malaria	37	4.5%
Total	815	100.0

**Table 3: Month wise distribution of malaria cases**

Month	Malaria			Total
	Vivax	Falciparum	Mixed	
January	10	0	0	10
February	28	1	1	30
March	93	7	2	102
April	71	14	2	88
May	71	14	3	72
June	68	9	4	81
July	109	15	5	129
August	88	13	7	108
September	52	4	3	59
October	46	7	5	58
November	50	6	4	60
December	15	2	1	18
Total	691	87	37	815

**Table 4: Treatment given for various types of malaria**

	Treatment		Total
	Chloroquine	Artemethar plus lumefantrene	
Vivax malaria	645	46	691
Falciparum malaria	0	87	87
Mixed malaria	0	37	37
Total	645	170	815

## DISCUSSION

Malaria is endemic in many areas of Pakistan. More than half of our population reside in malaria endemic areas<sup>11</sup>. Plasmodium infection is mainly attributed to Plasmodium vivax and falciparum. Mixed infections are also prevalent<sup>12</sup>. According to WHO report of 2012, Plasmodium vivax is responsible for 64% and Plasmodium falciparum is responsible for 36% of malarial infections<sup>13</sup>. According to Khattak AA., Plasmodium vivax caused 76% of malaria cases, Plasmodium falciparum caused 18% and mixed malaria in 6% cases in Pakistan<sup>12</sup>. Similarly, in a study at Quetta, Plasmodium Vivax was shown to be responsible for 81.66% cases and Plasmodium falciparum in 18.34% cases<sup>14</sup>. In our study, 84.5% were cases of vivax malaria, 10.7% falciparum malaria and 4.5% were mixed cases. Frequency of vivax, falciparum and mixed malaria was almost similar to that of Khattak et al. and Tareen AM et al.<sup>12,15</sup>.

However, a study conducted in Karachi reported higher frequency of falciparum malaria as compared to vivax malaria in Children Hospital Baqai Medical University Karachi i.e. 65% versus 35%<sup>14</sup>.

There was male majority in our study. Same was shown in previous studies of this region by Khattak et al., Tareen et al. and Yasinzi et al.<sup>12,15,16</sup>. Male predominance has been attributed to local culture of covering whole body by females, thus preventing mosquito bites<sup>12</sup>. Males also tend to roam and move around more for livelihood and job requirements making them susceptible to mosquito bites<sup>15</sup>.

Transmission of malaria is seasonal in Pakistan. Various factors including monsoon rains, floods, agricultural practices, irrigation, migrations etc. favor malarial transmission. Increase in cases of malaria is seen usually during July to August monsoon<sup>17</sup>. Vivax malaria has two peaks per year, one in late spring and other in summers/autumn<sup>18</sup>. However, falciparum malaria has been shown to increase in August, September temperatures<sup>19</sup>. In our study, majority of cases were seen in spring till monsoon season i.e. August. This is in accordance with previous studies<sup>12,15,16</sup>.

Chloroquine was shown as mainstay of treatment for plasmodium vivax<sup>20</sup>. Plasmodium vivax has been reported to show varying degree of sensitivity and resistance in various areas of the world. The initial cases of

chloroquine resistant plasmodium vivax were published in 1989<sup>21</sup>. Many reports have shown chloroquine resistance in many plasmodium vivax endemic countries<sup>22</sup>. Waqar T et al. has shown 100% sensitivity of uncomplicated plasmodium vivax to chloroquine in Lahore<sup>23</sup>. However, there is scarce data of chloroquine resistance in our country<sup>12</sup>. In our study, we found 93.34% sensitivity of plasmodium vivax to chloroquine and 6.66% resistance to chloroquine in vivax malaria.

Plasmodium falciparum resistant to chloroquine was first reported in 1984 in Pakistan and various studies later confirmed the resistance of<sup>24,25</sup>. Artemisinin containing compounds are usually recommended for plasmodium falciparum infection as it has superior efficacy. Plasmodium falciparum is considered dangerous because of severe complications, especially cerebral malaria, which has high mortality<sup>16</sup>. In our study, all cases of plasmodium falciparum were treated adequately with artemether plus lomefatrene. Mixed infections were also 100% sensitive to the combination. WHO recommends artemisinin bases combination therapy for uncomplicated plasmodium falciparum malaria. In combination, artemisinin containing compound plus another compound with different mechanism of action are most effective antimalarial available<sup>26</sup>. In complicated malaria, intravenous artesunate is the treatment of choice and it has reduced mortality in cases of severe malaria<sup>27</sup>.

## CONCLUSION

Malaria is still a significant problem in remote areas of Pakistan. Vivax malaria is most common variety followed by falciparum and mixed (Plasmodium vivax and plasmodium falciparum) malaria. Majority of malaria cases were seen from March to August which can be termed as peak season. Plasmodium vivax has promising sensitivity to chloroquine but in few resistant cases combination anti-malarial drugs have to be used. All the cases of uncomplicated falciparum and mixed malaria are sensitive to combination anti-malarial drugs.

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### CONTRIBUTORS

SA conceived the idea, wrote initial manuscript, collected data and finalized the draft. MAK and HBUS helped correction of the proposal, literature search, data collection, interpretation and overall supervision of the project. NN provided help in data collection and interpretation, refining of the draft and expert guidance where needed. All authors contributed significantly to the submitted manuscript.