

THE MAGNITUDE AND PATTERN OF MALARIA IN DISTRICT KOHAT

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ABSTRACT

Background: Malaria is a vector-borne infectious disease having a great potential to affect more people if neglected. This study aimed to know the magnitude of malaria and its various species in the local population.

Material & Methods: This retrospective study was conducted from 2004 to 2012 in the District Teaching Hospital, Kohat. Blood was taken from adult patients suspected for malaria. Thick and thin blood smears were prepared and stained with 10% Giemsa solution for microscopic diagnosis in the laboratory specified section for malaria. Negative slides were counter checked by another technician and positive slides were counter checked by consultant for species identification. Data was recorded for each month of the year for nine years.

Results: Out of 31128 samples, 2578(8.28%) were positive for malaria. Among positive cases, 1294 were males and 1284 females. There were 2226(86.34%) samples positive for Plasmodium vivax and 325(13.65%) for Plasmodium falciparum. No mixed infection was recorded. Malaria remained at peak from June to October. In 2004 to 2009, malaria was in range of 3.8 to 6.45% but in 2010 and 2011 it increased to 10.65 and 14.06% respectively. Plasmodium falciparum was at peak during September to November. P. vivax predominantly remained in mean of 86.34% to 13.65% of P. falciparum. In 2010 it reduced to 42.42% of P. vivax and P. falciparum enhanced to 57.58%. No case of Plasmodium ovale or Plasmodium malariae was recorded.

Conclusion: Malaria is on gradual increase in this area. Plasmodium vivax is more frequent than Plasmodium falciparum. Malaria peak months are June to October.

KEY WORDS: Malaria, Plasmodium, Vivax, Falciparum.

This article may be cited as: Khattak MA, Khan J, Batool N, Khan UH. The magnitude and pattern of malaria in district kohat. Gomal J Med Sci 2012; 11: 208-11.

INTRODUCTION

In spite of sufficient knowledge, modern diagnostic facilities and therapeutic regimes about malaria, it exists in many regions of the globe including Indian subcontinent and contributes to spread by travelling even to malaria-non-endemic regions.¹ An estimated 219 million cases of malaria occurred globally of which 660,000 people died of it in the year 2010.² Despite the running Malaria Control Programme in Pakistan, there are 500,000 infections and 50,000 deaths due to malaria each year.³

Malaria is caused by a hemoparasite called plasmodium (P) having 4 species known as vivax, falciparum, ovale and malariae in humans transmit-

ted by the bite of infected mosquitoes. P. vivax and P. falciparum are the two prevalent species reported in Pakistan.⁴⁻⁶ Climate of Pakistan ranges from tropical to temperate with dry condition and its surface is in the range from sea level to 9000 meters.^{7,8} Kohat is the city of Khyber Pakhtankhwa province located at the sea level 797 m which is in the range of malaria endemic region.²

Malaria is an infective disease causing morbidity and mortality in humans more in children, pregnant women and all others with immunocompromisation⁶. Fever, headache, rigors/chills and nausea/vomiting are the commonest symptoms and the commonest signs are high temperature, anemia and splenomegaly.⁹ The complications may be hepatic dysfunction, renal dysfunction, cerebral malaria, acute respiratory distress syndrome, shock, severe anemia, thrombocytopenia, jaundice, hemoglobinuria, hypoglycemia and even death.¹⁰⁻¹¹ During pregnancy, malaria increases the chance of spontaneous abortion, still birth, premature delivery and low birth weight.¹²

Although four species of malaria are existing

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but *P. vivax* and *P. falciparum* or their mixed infections are diagnosed within Pakistan.^{1,13} Species identification of malaria is important for treatment and seasonal variations are also observed for *P. vivax* and *P. falciparum*.^{14,15}

This study aimed to know the magnitude of malaria and its various species in the local population.

MATERIAL AND METHODS

This retrospective study was based on data for the years 2004 to 2012 in the District Headquarter Teaching Hospital, Kohat. Adult patients suspected for malaria referred to the laboratory were included. The staff was specially trained to work only in specific section for malaria diagnosis.

Thick and thin blood smears were prepared and stained with 10% Giemsa solution for microscopic diagnosis. Negative slides were counter checked by another technician and positive slides were counter checked by consultant for species identification. Cases of malaria positive by microscopy were recorded on monthly basis for the ongoing year. Demographic information of gender, age and localities of 27 union councils or federally administered tribal areas adjacent to Kohat was recorded. The study was approved by Institutional Review Board for Bioethics of KMU Institute of Medical Sciences.

Table 1: Frequency and gender distribution of Plasmodium vivax and Plasmodium falciparum.

Gender	Plasmodium vivax	Plasmodium falciparum	Total
Male	1108	186	1294
Female	1118	166	1284
Total	2226	352	2578

Table 2: Frequency of malaria for the months of the years 2004 to 2012

Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Positive /Total (%)
2004	3	2	3	3	3	6	3	3	13	3	1	1	44/1156(3.80)
2005	2	0	2	2	2	6	2	6	2	3	0	2	29/1242(2.33)
2006	0	3	4	2	2	3	9	11	15	2	5	7	63/1744(3.61)
2007	3	2	6	7	10	11	15	26	9	15	5	4	113/2173(5.20)
2008	4	9	16	7	21	20	21	37	20	15	12	5	187/3209(5.82)
2009	10	8	10	16	27	26	24	13	12	24	22	18	210/3254(6.45)
2010	10	8	32	19	32	33	57	150	75	56	56	27	555/5211(10.65)
2011	18	8	18	46	79	178	126	113	153	204	77	14	1034/7354(14.06)
2012	13	14	21	25	36	49	53	24	47	28	21	12	343/5785(5.92)
Total	63	54	112	127	212	332	310	383	346	350	199	90	2578/31128(8.28)

RESULTS

During the study period 31,128 patients were tested for malaria. Out of these 2578 (8.28%) were malaria positive; 2226 for *P. vivax* and 352 for *P. falciparum*. No mixed case was recorded. Gender distribution of positive cases is given in Table 1.

There was gradual increase in annual parasite incidence from 2004 to 2009 but gross increase was observed in 2010 and 2011 and again

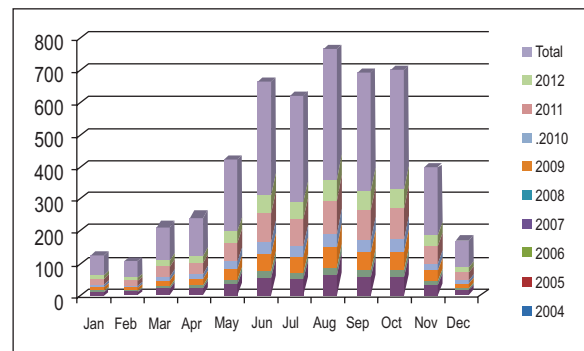


Figure 1: Year-wise and accumulative magnitude of Plasmodium positivity.

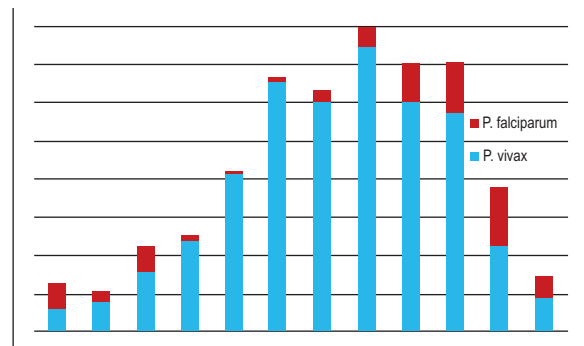


Figure 2: Accumulative positivity of malaria during 2004-2012.

Table 3: Gender distribution of Plasmodium vivax and Plasmodium falciparum.

Year	P. vivax		P. falciparum		Ratio P. vivax to falciparum
	Males	Females	Males	Females	
2004	34	4	5	1	86.36/13.63
2005	23	3	3	0	89.66/10.34
2006	31	23	5	4	85.71/14.29
2007	59	34	15	5	82.30/17.69
2008	94	60	21	12	82.35/17.65
2009	96	76	22	16	81.98/18.02
2010	189	220	67	79	42.42/57.58
2011	428	528	37	41	92.45/7.55
2012	154	170	11	8	94.46/5.54
Total of 9 years	1108	1118	186	166	86.34/13.65

Table 4: Month-wise frequency of Plasmodium vivax and Plasmodium falciparum from 2004 to 2012.

Malaria	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
P. vivax	30	40	79	120	207	327	302	374	302	286	114	45	2226
P. falciparum	33	14	33	7	4	5	13	23	51	66	75	28	352

decrease in 2012. (Table 2)

High parasite incidence of malaria was seen during June to October for the years 2004 to 2012. While rest of the months of years were still showing considerable cases.

Male patients were found positive for malaria more as compared to females during 2004-2009 and 2012 but reverse was seen during 2010 and 2011. Incidence in % of P. vivax was in the range of 81.98 to 89.66 during 2004 to 2009 as compared to P. falciparum but increased to 92.45 and 94.46 in 2011 and 2012 respectively while gross change in ratio was 42.42/57.58 in 2010. (Table 3)

Malaria as a whole remains throughout the months of year however more in June to October. No special relation of species was seen with change in temperature. P. vivax remained almost in all months but P. falciparum was not present in most of the months of all calendar years from 2004 to 2012 except 2010 in which P. falciparum was found prevalent throughout the year. (Table 4)

DISCUSSION

The current scenario of malaria incidence even today in the global and regional perspective is indicating an alarming trend in terms of magnitude of occurrence in the population worldwide and equally in the tropical environment of Pakistan. However the endemicity has considerably been reduced as

a result of the governmental and WHO supported interventional programs in eradication of the disease. In the present study it was noted that out of the total 2578/31128 (8.28%), there appeared a steadily inclining trend in the annual parasite incidence in the years 2004-2009 (3.8 to 6.45%) with the months of June to October representing the highest frequency for both P. falciparum and P. vivax.² Our study results show too much low incidence as compared to 29.7% in Qilla Saifullah and 14.6% in Qallat study results by Yasinzai & Kakarsulemankhel 2008 in Balochistan¹⁶ and by Khattak et al 2013 (10.8%) from districts adjoining to Kohat.⁶

The frequency of Plasmodium vivax was higher than Plasmodium falciparum is in agreement to most of studies with varying percentages from different districts of Khyber PaktoonKhwa.^{6,17} The incidence of P. vivax was more as 81.98% to 89.66% from 2004 to 2009 as compared to P. falciparum incidence in Kohat where the specific change in ratio in 2010 was 42.42%/57.58% (Table 3). The variability in the transmission period is noted as post monsoon from August to November² (Table 4) as the major harboring season for anopheles mosquitoes and also the widely distributed P. vivax that dominates P. falciparum resulting in significant rise with similar pattern seen in Khyber Pakhtoonkhwa, Punjab, Sindh and Balochistan,^{6,18} but our study results were dissimilar (P. falciparum 52.65%) greater than P. vivax in Jamshoro probably due to hot climate.¹⁹

The frequency of *P. vivax* and *P. falciparum* (Table 5) showed that *P. vivax* is considerably endemic throughout the year from 2004 to 2012 as compared to *P. falciparum* except in year 2010 when the latter appeared more, may be due to marked seasonal variation with heavy rainfall leading to flood disaster causing more damage to shelters during this year. The limited access to early diagnosis, effective treatment and preventive measures might have changed the probable frequency of *P. falciparum* in the 2010 as the actual malaria burden during the year could not be represented as 70-80% of the population goes to private sector for treatment.²

Within the span of 2004 to 2012 almost a decade long effort of the close malaria controls partners and their resources have greatly contributed in the eradication plan with progress on Roll Back Malaria goals. The impact in the region both locally and globally indicates that these international programs have led to decreased morbidity and mortality throughout the world and there are hopes that ultimately malaria can be eradicated.²

CONCLUSION

Malaria is on gradual increase in this area. *P. vivax* is more common than *P. falciparum*. Malaria remains throughout the year but peak months of the year are from June to October.

Acknowledgement: We are thankful to Mr. Arshad, Mr. Haseebullah and Mr. Ferdous, the laboratory technicians for their help during this study.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
GRANT SUPPORT AND FINANCIAL DISCLOSURE
None declared.