

PREVALENCE OF HUMAN MALARIA INFECTION IN PAKISTAN: DISTRICT DERA MURAD JAMALI¹

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ABSTRACT: This study was conducted to investigate the prevalence of malarial infections in human population in 3 localities of district Dera Murad Jamali, Pakistan. Malarial parasites were identified in the blood slides of suspected patients of the disease from July, 2004 to June, 2006. Out of 6757 suspected cases of malaria, 40.4% were found to be positive for malarial parasite in blood smear slides. Out of positive cases, 71.7% were identified as *Plasmodium vivax* infection and 28.2% cases with *P. falciparum*. However, seasonal variation was also noted in Dera Murad Jamali area with the highest (84.5%) infection of *P. vivax* in October and lowest (62.2%) in January while infection of *P. falciparum* with the highest (37.7%) in January and lowest (15.4%) in the month of October. Infection with *P. vivax* in male was 66.6% and in female 21.8% whereas infection of *P. falciparum* in male was 34.9% and in female was 11.5%. There was no case of *Plasmodium malariae* and *P. ovale* infection observed in the present study. In conclusion it can be pointed out that in our study the prevalence rate of 71.7% of *P. vivax* poses a significant health hazard because not only *P. vivax* infection but infection with *P. falciparum* 28.2% also may lead to serious complications like cerebral malaria. No association between types of infection, age groups and sex of the patients was observed. Therefore, it can be said that the incidence of any type of infection can happen to any age group person independently.

Key words: Human malarial infection, *Plasmodium vivax*, *P. falciparum*, Dera Murad Jamali

INTRODUCTION

Malaria is one of the most devastating diseases in the World. Over 3 billion people live under the threat of malaria in 24 endemic countries (WHO/UNICEF,2005) and it kills over a million each year- mostly children (Korenromp,2004).

According to the United Nations World Health Organization (WHO), Pakistan has been classified as a country with moderate malaria prevalence and relatively well-established control programs. Despite this, the disease is estimated to cause at least 50,000 deaths out of an estimated 500,000 reported malaria cases every year (IRIN,2007).

About 40% of cases are due to *Plasmodium falciparum* which is significantly more common in the Sindh Province. *P. falciparum* has developed resistance to chloroquine. The two main malaria vectors- *An. culicifacies* and *An. stephensi* are both resistant to organochlorines and the later has also developed resistance to organophosphate (Malathion) (Country Report Pakistan,2003). In Pakistan Hozhabri *et al.* (2000) studied prevalence of plasmodium slide positivity among the children treated for malaria at Rural Health Center (RHC)

Jhangara, Sindh and observed slide positivity rate 5.9%. Bhalli and Samiullah (2001) investigated 120 cases of falciparum malaria at CMH, Multan to evaluate seasonal variation and modes of presentation. They observed high incidence of falciparum malaria among troops in the moths of August to November. Akbar (2002) reported malaria at a children hospital Baqai Medical University and observed high incidence of *falciparum* as compared to *vivax* (65% vs 35%).

Mohammad and Hussain (2003) studied prevalence of malaria in general population of district Buner and highest rate of infection (11.6%) was recorded in August while the lowest rate of infection (3.9%) was noted in March. Malaria in pediatric age group of 200 cases was investigated by Jamal *et al.* (2005) and found high rate of *P. vivax* (62.5%) than *P. falciparum* (36%). Malaria in Karachi and other areas in Sindh was studied by Mahmood (2005) and observed *P. vivax* to be two times higher than *P. faciparum*. Nizamani *et al.* (2006) found that *P. falciparum* ratio was noted to be increasing in many districts of Sindh. Malaria in North West Frontier Province (NWFP) was studied by Saleem *et al.* (2006) and observed cerebral malaria more common in males and most

vulnerable group was pregnant women. Akbar *et al.* (2006) investigated malaria in 160 cases of children in Mansehra and observed 142 cases suffering from *vivax* and 12 from *falciparum*. Idris *et al.* (2007) while studying pattern of malarial infection at Ayub Teaching Hospital Abbottabad found that out of 1994 patients screened, 145 (7.2%) were found infected. *P. vivax* was seen in the majority (72.4%) than *P. falciparum* (24.1%).

In Balochistan too, cerebral malaria is a major community problem. Durrani *et al.* (1997) studied epidemiology of cerebral malaria and its mortality in patients of Quetta city and observed 64% cases of cerebral malaria in children and 36% in adults. Yasinzaï and Kakarsulemankhel (2003,2004) investigated the incidence of malaria infection in urban and rural areas of Quetta district and reported higher incidence of *Plasmodium falciparum* (17.7%, 16.3%) in 2003 and 2004 in the age group of 21 years and above. However, the objective of the present study was to investigate the rate of prevalence of malarial parasites in human populations of district Dera Murad Jamali.

MATERIALS AND METHODS

A survey was conducted during July, 2004 to June, 2006 in 3 malarious localities of district of Dera Murad Jamali to record and screen species of malarial parasites from the blood of human patients suffering from malaria.

Location: District Dera Murad Jamali (28° Lat., 68° Long., 62 (M) Height) is situated at the central-eastern border of Balochistan province adjoining western border of Sindh province where cases of human malaria are very frequent.

The age grouping of the patients was divided in to 3 categories: 1-10 years of age, 11 to 20 years and 21 years and above. Malaria cases were detected by adapting two ways (Manson-Bahr and Bell, 1987).

a) Passive case detection (PCD) technique where in blood films were taken from the patients coming to a health station with symptoms of shivering and fever or a history suggestive to malaria.

b) Active Case Detection (ACD) in which home visits were made to the persons with sign or symptoms of malaria and blood films of both thin and thick were prepared. For ACD malarious localities in the areas were selected and house visits of suspected patients of malaria were made

with the help of head/ Malik's of these localities. Blood slides were taken back to the laboratory where they were stained in Giemsa's stain following the techniques described by Manson-Bahr and Bell (1987). Identification of species of malarial parasites were made from the keys furnished by Service (1986) and Sood (1989).

Inclusion criteria were presence of fever, chill, and vomiting. Exclusion criteria were Widal test. Blood culture and Brucella antibody test were not conducted.

Statistical analysis: The data were statistically analyzed to test if there exists any association between types of infection and age groups through a *Chi square test* formula mentioned below:-

$$X^2_{\text{(calculated value)}} = \sum \frac{(fo - fe)^2}{fe}$$

RESULTS AND DISCUSSION

A total of 6757 blood smears were prepared from the age groups ranging from 1 year to 21 years and above residing in 3 localities of Dera Murad Jamali (Table 1-4). However, variations were observed among different localities having different hygienic conditions. In Dera Murad Jamali area (Table 1-4), the over all prevalence of *Plasmodium* positivity was 40.4%, wherein *Plasmodium vivax* positivity was observed to be highest (71.7%) as compared with that of *P. falciparum* (28.3%).

Table: 1. Localities and overall prevalence of malaria infection in Dera Murad Jamali district.

S No. Localities	No. of slides examined	Total No. of +ve	No. of +ve	
			<i>P. vivax</i> (%)	<i>P. falciparum</i> (%)
1. Dera Murad Jamali City	3445	1311	872 (66.5)	439 (33.4)
2. Chattar Tehsil	1793	751	549 (73.1)	202 (26.9)
3. Tamboo Tehsil	1519	668	537 (80.3)	131 (19.6)
Total	6757	2730	1958 (71.7)	772 (28.3)

Table: 2. Month wise and overall prevalence of malaria infection in Dera Murad Jamali district.

Month	No. of slides Examined	Total No. of +ve	<i>P. vivax</i> (%)	<i>P. falciparum</i> (%)
July,04,05	541	240	178 (74.1)	62 (25.8)
August	594	287	217 (75.6)	70 (24.3)
September	637	274	189 (68.9)	85 (31)
October	672	239	202 (84.5)	37 (15.4)
November	581	203	152 (74.8)	51 (25.1)
December	564	196	139 (70.9)	57 (29)
January,05,06	397	183	114 (62.2)	69 (37.7)
February	403	168	121 (72)	47 (27.9)
March	746	297	191 (64.3)	106 (35.6)
April	789	311	213 (68.4)	98 (31.5)
May	456	174	133 (76.4)	41 (23.5)
June,05,06	377	158	109 (68.9)	49 (31)
Total	6757	2730	1958 (71.7)	772 (28.3)

Table: 3. Age-wise overall prevalence of malaria infection in Dera Murad Jamali district.

Age (years)	No. of slides examined	Total No. +ve	Overall infection (%)	<i>P. vivax</i> (%)	<i>P. falciparum</i> (%)
1-10	1852	686	37	489 (71.2)	197 (28.7)
11-20	2537	1066	42	771 (72.3)	295 (27.6)
21-above	2468	978	39.6	698 (71.3)	280 (28.6)
Total	6757	2730	40.4	1958 (71.7)	772 (28.3)

Table: 4. Month and sex-wise prevalence of malaria infection in Dera Murad Jamali district.

Month	No. of slides examined	Total No. of +ve	Male	Female
			<i>P. v.</i>	<i>P. f.</i>
July,04,05	541	240	147	93
August	594	287	183	104
September	637	274	156	118
October	672	239	153	86
November	581	203	127	76
December	564	196	102	94
January,05,06	397	183	95	88
February	403	168	112	56
March	746	297	152	145
April	789	311	145	166
May	456	174	95	79
June,05,06	377	158	86	72

The data mentioned in Tables 1- 4 were statistically analyzed in Table 5 in order to test if

there is any association between types of infection and age groups through the formula X^2 (calculated value) at 5% level of significance.

Table 5: Statistical analysis of Types of Infection in different age groups of malarial patients

Age (Years)	A (fo)	(fe)	B (fo)	(fe)	Total
1-10	489	492.01	197	193.9	686
11-20	771	764.55	295	301.4	1066
21 above	698	701.43	280	276.56	978
Total	1958		772		2730

$$X^2_{\text{calculated}} = \sum \frac{(fo - fe)^2}{fe} = 0.31699$$

fo=1st and 2nd column show the incidence rate of *P. vivax* and *P. falciparum* respectively.

fe=1st and 2nd column show the % of infection of both the columns. It reveals X^2 calculated was 0.31699 as compared with the table value of $X^2=5.991$. Since calculated value of X^2 is less than the table value so it is concluded that there is no association between types of infection and age groups, and the incidence of any type of infection can happen to any age group person independently.

DISCUSSION

Malaria affects an estimated 300 million people and causes more than a million deaths per year worldwide. Falciparum malaria has high mortality as it causes complications like cerebral malaria, renal failure and algid malaria (Bhalli and Samiullah,2001).

In the present study, the prevalence of *P. vivax* was observed to be higher (71.7%) as compared with that of *P. falciparum* (28.2%). Many research workers reported higher prevalence of *P. vivax* in districts of Multan (60.5 % *P. vivax*, 37.2% *P. falciparum*), Muzaffarabad (90.4% *P. vivax*, 0.6% *P. falciparum*), Buner (5.7% *P. vivax*, 1% *P. falciparum*), Quetta (66.8% *P. vivax*, 30.7% *P. falciparum*), Dera Murad Jamali (76.2 73.5, 75.8 % *P. vivax*, 23.8,26.4,24.1% *P. falciparum*), Qilla Abdullah (97.3,100, 100% *P. vivax*, 2.6,0,0% *P. falciparum*), Noshki (98.1,79.2,86.5% *P. vivax*, 1.8,20.7,13.4% *P. falciparum*), Dalbandin (98.1,64.8,72.2% *P. vivax*, 1.8, 35.1,27.7% *P. falciparum*), Qilla-Abdullah (62.2% *P. vivax*, 37.7% *P. falciparum*), Mastung and Khuzdar (52.6, 69.8% *P. vivax*, 47.3, 30.1% *P. falciparum*), Kohlu (58.9% *P. vivax*, 41% *P. falciparum*), Zhob

(51.8% *P. vivax*, 48.1% *P. falciparum*), Kharan (88.6% *P. vivax*, 11.3% *P. falciparum*), Sibi (72.3% *P. vivax*, 27.6% *P. falciparum*) (Yar *et al.*, 1998; Jan and Kiani, 2001; Mohammad and Hussain, 2003; Sheikh *et al.*, 2005; Malaria Control Program, 2004, 2005, 2006; Yasinzai and Kakarsulemankhel, 2007a, 2007b, 2008a, 2008b, 2008c, 2008d) respectively.

In the present study, 19.8, 22, 58.1% *P. vivax* was observed in the patients of the age group of 1-10, 11-20, and 21 years and above. Similarly, Jan and Kiani (2001) found 8.4% and 73.6% in the patients of the age group of 11-20 years and 21 years and above respectively in Kashmiri refugees settled in Muzaffarabad. Khadim (2002) reported *P. vivax* of 6.2, 8.4 and 73.6% in the patients of the age group of 1-10, 11-20, and 21 years at Zhob Garrison respectively. 6, 3, 7.8% and 7, 4.4, and 10.5% *P. vivax* were observed in Quetta rural and urban respectively, 55, 62.3, 65.4% (in Qilla-Abdullah); 53.6, 51.9, 52.9% (Mastung); 68.5, 71.9, 68.9% (Khuzdar); 62.9, 54.3, 62.5% (Kohlu); 52.8, 52.8, 49.6% (Zhob); 86.8, 88.9, 88.9% (Kharan); 70.3, 77.7, 70.6% (Sibi) in the age group of 1-10, 11-20 and 21 years and above (Yasinzai and Kakarsulemankhel, 2003, 2004, 2007a, 2007b, 2008a, 2008b, 2008c, 2008d).

Zarchi *et al.* (2006) reported slide positivity rate of 9.6% in the patients of Iran. 16.2, 15.4; 34.8; 11.4; 24.5, 28.4; 26.2; 41.8; 43.4; 33.2% slide positivity rate was observed in Quetta rural and urban, Qilla Abdullah, Mastung & Khuzdar, Kohlu, Zhob, Kharan and Sibi districts by Yasinzai and Kakarsulemankhel (2003, 2004), Shaikh *et al.* (2005), Yasinzai and Kakarsulemankhel (2007a, 2007b, 2008a, 2008b, 2008c, 2008d) respectively. However, mixed infection of *P. vivax* and *P. falciparum* was not observed in the present study, as mixed infection of 2.3% was observed in Multan district by Yar *et al.* (1998).

However, the same 2.3% was observed in Quetta district (Sheikh *et al.*, 2005).

During present study, no case of *P. malariae* or *P. ovale* infection was observed, as the same was also not observed by Yar *et al.* (1998) in Multan.

In conclusion, it can be suggested that infection with *P. vivax* was found to be more prevalent in Dera Murad Jamali district. In this study the prevalence rate of 71.7% of *P. vivax* poses a significant health hazard as it may lead to serious complications like cerebral malaria and also *P. falciparum* infection (11.3%). Previously, Abbasi

and Shaikh (1997) reported that recently World Health Organization has reported the occurrence of cerebral malaria due to *P. vivax* also.

In spite of malaria control program, it still remains a great challenge. Keeping in view the results of the present investigation, Directorate of Malaria Control Program (MCP) Balochistan, should expedite malaria control program. A joint effort in this regard is to be organized by Health Department, Irrigation Department and Local Government to eradicate the favorable epidemiological factors, which promote the spread of malaria, so as to ensure the public health of the inhabitants of mentioned areas.

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