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Full Length Article

Incidence of Human Malaria Infection in Desert Area of Pakistan: District Kharan

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ABSTRACT

This study was conducted to investigate the incidence of malarial infections in human population in 15 localities of district Kharan, Balochistan, Pakistan. Malarial parasites were identified in the blood slides of suspected patients of the disease from July, 2004 to June, 2006 and encompassed 5598 subjects. Out of 5598 suspected cases of malaria, 2432 (43.44%) were found to be positive for malarial parasite in blood smear slides. Out of positive cases, 2157 (88.69%) were identified as *Plasmodium vivax* infection, 275 (11.30%) cases with *P. falciparum.* However, seasonal variation was also noted in Kharan area with the highest (96.93%) infection of *P. vivax* in March and lowest (81.33%) in October while infection of *P. falciparum* with the highest (18.66%) in October and lowest (3.06%) in the month of March. Infection with *P. vivax* in male was 97.37% and in female 95.45% whereas infection of *P. falciparum* in male was 17.94% and in female was 50%. 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 incidence rate of 88.69% of *P. vivax* poses a significant health hazard because not only *P. vivax* infection but infection with *P. falciparum* 11.30% also may lead to serious complications like cerebral malaria. It can be suggested that infection with *P. vivax* was found to be more prevalent in Kharan area. It seems that there is no association between types of infection and age groups. Therefore, it can be concluded 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;* Kharan

INTRODUCTION

Malaria affects an estimated 300 million people and causes more than a million deaths per year World-wide (Bhalli & Samiullah, 2001). According to World Health Organization study group (WHO, 1993) malaria is a major killer of mankind and is responsible for 300 to 500 million clinical cases and 1.5 to 2.7 million deaths per year. Some 270 million new cases of malaria occur every year of which 95% are reported from these areas (Anwar *et al.,* 1994).

Falciparum and *vivax* malaria are major health problems in Pakistan. In the last decade there has been a six fold increase in *Falciparum* malaria, which now comprises 42% of all malaria cases recorded by National Malaria Control Program (Shah *et al.,* 1997). Factors associated with the upsurge include of chloroquine resistance across the country (Shah *et al.,* 1997), warmer autumns favoring prolonged transmission (Bouma *et al.,* 1996) and a chronic decline in vector control activities. *Anopheles culicifacies,* the purported primary vector in the Punjab Province (Reisen & Boreham, 1982) was found more or less disappeared by September whereas *A. stephensi* was found more abundant and more common in North-West Frontier Province than *A. culicifacies.* In Pakistan, the primary vector species are *A. culicifacies* and *A. stephensi* and in Quetta Balochistan also (MCP, 1999-2000; Yasinzai & Kakarsulemankhel, 2003-2004).

As cerebral malaria is a major community problem in Balochistan, the present study was carried out to investigate the incidence of malarial parasites in human populations residing in the district of Kharan.

MATERIALS AND METHODS

A survey was conducted during July, 2004 to June, 2006 in 15 localities of district of Kharan to record and screen species of malarial parasites from the blood of human patients suffering from malaria.

Location. District Kharan is situated at the central-western border of Balochistan province adjoining with eastern border of Iran, where cases of human malaria are very frequent. In this study, malaria cases were detected by adapting two ways (Manson-Bahr & Bell, 1987). Passive case detection (PCD) technique where in blood films were taken from the patients presenting themselves to a health station with symptoms of shivering and fever or a history suggestive to malaria. The other technique is active case detection (ACD) in which home visits were made to the

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persons with sign or symptoms of malaria and blood films of both thin and thick were prepared. 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 was made from the keys furnished by Service (1986) and Sood (1989).

RESULTS

A total of 5598 blood smears were prepared from the age groups ranging from 1 year to 21 years and above residing in different localities of Kharan (Table I-IV). However, variations were observed among different localities having different hygienic conditions.

In Kharan area (Table I-IV), the over all incidence of *Plasmodium* was 43.44%, wherein *Plasmodium vivax* was observed to be the highest (88.69%) as compared with that of *P. falciparum* (11.30%). Among *Plasmodium* slide positivity, children (1-10 years), 86.86% were positive for *P. vivax* and 13.13% for *P. falciparum.* The commonest species of malarial parasites observed was *P. vivax* with a highest incidence of 88.96% in the age group of 11-20 years and 88.93% in the age group of 21 years and above. *P. falciparum* was also observed to be present in our study but comparatively with a less incidence ration viz., 11.06% in the age group of 21 years and above and 11.03% in the age group of 11-20 years. However, seasonal variation was also noted in Kharan area with the highest (96.93%) infection of *P. vivax* in March and the lowest (81.33%) in October while infection of *P. falciparum* with the highest (18.66%) in October and lowest (3.06%) in the month of March. Infection with *P. vivax* in male was 97.37% and in female 95.45%, whereas infection of *P. falciparum* in male was 17.94% and in female was 50%.

Statistical analysis: Types of Infection.

Age		A		B	Total
(Years	(fo)	(fe)	(fo)	(fe)	
1-10	258	263.41	39	33.58	297
11-20	782	779.60	97	99.39	879
21 above	1117	1113.97	139	142.02	1256
Total	2157		275		2432

$$X^2_{cal} = \Sigma \frac{(fo - fe)^2}{fe} = 1.12325$$

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.

Table 1-4 (Kharan area) was statistically analyzed to test whether there is any association between types of infection and age groups through X^2 at 5% level of significance, X^2 calculated as 1.12325 and compared with the table value of X^2= 5.991. Since calculated value of X^2 is less than the table, it can be concluded that the incidence of any type of infection can happen to any age group person independently.

Table I. Area and over all incidence of malaria infection in Kharan district

S. No	Area	No. of slides examined	Total No of +ve	No. of +ve species wise	
				P. vivax (%)	P. falciparum (%)
1.	Kharan	1047	426	385 (90.37)	41 (9.62)
2.	Nauroz Kallat	306	123	110 (89.43)	13 (10.57)
3.	Sarawan	255	112	96 (85.71)	16 (14.28)
4.	Basima	637	272	240 (88.23)	32 (11.76)
5.	Nag	661	324	296 (91.36)	28 (8.64)
6.	Washuk	543	265	235 (88.68)	30 (11.32)
7.	Sardarchah	260	97	79 (81.44)	18 (18.56)
8.	Salambek	153	62	51 (82.26)	11 (17.74)
9.	Sargari	237	90	74 (82.22)	16 (17.78)
10.	Duzab	181	78	69 (88.46)	9 (11.54)
11.	Girdih	189	93	86 (92.47)	7 (7.53)
12.	Soran Killa	107	37	25 (67.57)	12 (32.43)
13.	Jamak	397	182	164 (90.11)	18 (9.89)
14.	Surah	196	67	57 (85.07)	10 (14.92)
15.	Mashkel	429	204	190 (93.14)	14 (6.86)

Table II. Month wise and over all incidence of malaria infection in Kharan district

Month	No. of slides Examined	Total of +ve	No. P. vivax (%)	P. falciparum (%)
July, 2004	674	287	253 (88.15)	34 (11.84)
August	703	396	339 (85.60)	57 (14.39)
September	727	421	375 (89.07)	46 (10.92)
October	580	209	170 (81.33)	39 (18.66)
November	463	164	147 (89.63)	17 (10.36)
December	378	114	101 (88.59)	13 (11.40)
January,	221	56	47 (83.92)	9 (16.07)
February	236	68	63 (92.64)	5 (7.35)
March	269	98	95 (96.93)	3 (3.06)
April	360	134	122 (91.04)	12 (8.95)
May	433	192	175 (91.14)	17 (8.85)
June, 2006	554	293	270 (92.15)	23 (7.84)
Total	5598	2432	2157 (88.69)	275 (11.30)

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 & Samiullah, 2001). In our study, the incidence of *P. vivax* was observed to be higher (88.69%) as compared with that of *P. falciparum* (11.30%). Similarly, Yar *et al.* (1998), while studying prevalence of malarial parasite species in Multan district, observed high incidence of *P. vivax* (60.50%) and a low incidence of *P. falciparum* (37.20%). Among Plasmodium slide positivity, 19.80% children (1-10 years), 22% in the age group of 11-20 years and 58.13% in the age group of 21 years and above for *P. vivax.* Similarly, Jan and Kiani (2001) while studying malarial parasites in Kashmiri refugees settled in Muzaffarabad reported high incidence (6.33%) of *P. vivax* than of *P. falciparum* (0.67%). Among slide positivity, 6.25% in children of the age group of 1-10 years, 8.41% in the age group of 11-20 years, 73.68% in the age group of 21 years and above. Mohammad and Hussain (2003) observed high incidence of *P. vivax* (5.78%) and 1.08% *P. falciparum*

Table III. Age-wise over all incidence of malaria infection in Kharan district

S.No.	Age (years)	No. of slides examined	Total No + ve	Over all % infection	Infection by P. vivax (%)	Infection by P. falciparum (%)
1.	1-10	883	297	33.63	258 (86.86)	39 (13.13)
2.	11-20	2171	879	40.48	782 (88.96)	97 (11.03)
3.	21- above	2544	1256	49.37	1117 (88.93)	139 (11.06)
Total		5598	2432	43.44	2157 (88.69)	275 (11.30)

Table IV. Month and sex wise incidence of malaria infection in Kharan district

Month	No. of slides examined	Total No. of +ve	Male		Female	
			P. v.	P. f .	P. v.	P. f
July, 2004	674	287	159	31	94	3
August	703	396	230	40	109	17
September	727	421	285	40	90	6
October	580	209	149	18	21	21
November	463	164	133	13	14	4
December	378	114	66	9	35	4
January	221	56	32	7	15	2
February	236	68	51	4	12	1
March	269	98	74	2	21	1
April	360	134	87	9	35	3
May	433	192	115	13	60	4
June	554	293	198	19	72	4

infection among the general population of district Buner. The higher rate of infection was found in age group 1-10 years (11.58%) and the lowest (5.19%) in age group of 51-70 years. The highest rate of infection was recorded in August (1.66%), while the lowest rate of infection (3.98%) was noted in March.

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). 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 Kharan district. In our study the incidence rate of 88.69% of *P. vivax* poses a significant health hazard as it may lead to serious complications like cerebral malaria and also *P. falciparum* infection (11.30%).

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