Original Article

INCIDENCE OF HUMAN MALARIA INFECTION IN BARKHAN AND KOHLU, BORDERING AREAS OF EAST BALOCHISTAN

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ABSTRACT

Objective: To determine the incidence of malarial parasites in human population of Barkhan and Kohlu areas of Pakistan.

Methodology: Malarial parasites were identified in the blood slides of suspected patients of the disease from July 2004 to June 2006 and encompassed 3340 subjects.

Results: Out of 3340 suspected cases of malaria, 1095 (32.78%) were found to be positive for malarial parasite in blood smear slides. Out of positive cases, 579 (52.87%) were identified as *Plasmodium falciparum* infection and 516 (47.12%) cases with *P. vivax*. There was no case of *Plasmodium malariae* and *P. ovale* infection observed in the present study.

Conclusion: The prevalence rate of 52.87% (579/1095) of *P. falciparum* poses a significant health hazard because not only *P. falciparum* infection but infection with *P. vivax* 47.12% (516/1095) may also lead to serious complications like cerebral malaria. Infection with *P. falciparum* was found to be more prevalent in Barkhan and Kohlu area. It seems that there is no association between types of infection and age groups.

KEY WORDS: Malarial parasite, Plasmodium falciparum, P. vivax.

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INTRODUCTION

Among blood infections, malaria is the most widespread, a global threat and potentially a public health problem of the tropics with its morbidity and mortality at unacceptable high levels in the region.[1] According to World Health Organization study group[2] 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.[3] 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.[4] At least 39 districts, mainly from the two southern provinces of Balochistan and Sindh, have been classified at high risk, partly due to the weak public health infrastructure.

In Pakistan, Bano and Mufti[5] studied human malaria in a selected population of Peshawar. Hadi et al.[6] investigated endemic malaria in Punjab children. Malaria in Afghan refugees in Pakistan was studied by Suleman[7] and observed that malaria in Afghan refugees is

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higher than in the local population. Nizamani *et al*[8] investigated fifty cases of cerebral malaria in children in Liaqat Medical College Hospital, Jamshoro. In Balochistan too, cerebral malaria is a major community problem. Nawaz and Yasmin [9] studied the prevalence of malaria in Afghan refugees settled in urban areas of district Quetta. Yasinzai and Kakarsulemankhel[10,11] investigated the prevalence of malaria infection in urban and rural areas of Quetta district. However, the present study was carried out to find out the prevalence of malarial parasites in human populations residing in the districts of Barkhan and Kohlu. This is perhaps the first study of its find conducted on patients suffering from Malaria in these areas.

METHODOLOGY

A survey was conducted during July, 2004 to June, 2006 in the areas of districts of Barkhan and Kohlu to record and screen the species of malarial parasites from the blood of human patients suffering from malaria.

Malaria cases were detected by adapting two ways. 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 of malaria. The other technique is active case detection (ACD)[12] 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. 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.[12] Identification of species of malarial parasites were made from the keys furnished by Service[13] and Sood.[14]

RESULTS

A total of 3340 blood smears were prepared from the age groups ranging from one year to 21 years and above residing in ten and seven different localities of Barkhan (Table-I-II) and Kohlu (Table-III & IV) respectively. However, variations were observed among different localities having different hygienic conditions.

In Barkhan area (Table-I-II), the over all incidence of Plasmodium slide positivity was 32.78% (1095/3340), whereas *Plasmodium falciparum* positivity was observed to be highest (52.87%: 579/1095) as compared with that of *P. vivax* (47.12%: 516/1095). Among Plasmodium slide positivity, children (1-10 years), 60.11% (107/178) were positive for *P. falciparum* and 39.88 % (71/178) for *P. vivax.* The commonest species of malarial parasites observed was *P. falciparum* (Fig-I) with a highest incidence of 65.80 % (152/231) in the age group of 21 years and above, and 56.79 % (138/243) in the age group of 11-20 years. *P. vivax* (Fig-II) was also observed to be present

Table-I: Month wise incidence of malaria infection in Barkhan

Month	*No. of slides examined*	*Total No. of +ve*	*P. vivax (%)*	*P. falciparum (%)*
July, 2004	240	87	23 (26.43)	64 (73.56)
August	273	108	29 (26.85)	79 (73.14)
September	311	134	45 (33.58)	89 (66.41)
October	221	83	34 (40.96)	49 (59.03)
November	143	62	19 (30.64)	43 (69.35)
December	86	37	20 (54.05)	17 (45.94)
January	63	24	16 (66.66)	8 (33.33)
February	39	19	14 (73.68)	5 (26.31)
March	47	11	7 (63.63)	4 (36.36)
April	61	23	16 (69.56)	7 (30.43)
May	77	29	18 (62.06)	11 (37.93)
June, 2006	89	35	14 (40)	21 (60)
Total	1650	652	255 (39.11)	397 (60.88)

Table-II: Age wise over all incidence of malaria infection in Barkhaan

S. No.	Age (Years)	No. of slides examined	Total No. of +ve	Over all % Infection	Infection by *P. vivax (%)*	Infection by *P. falciparum (%)*
1.	1- 10	435	178	40.91	71 (39.88)	107 (60.11)
2.	11- 20	649	243	37.44	105 (43.20)	138 (56.79)
3.	21- above	566	231	40.81	79 (34.19)	152(65.80)
	Total	1650	652	39.51	255 (39.11)	397(60.88)

in our study but comparatively with a less prevalence ratio of 43.20 % (105/243) in the age group of 11-20 years and 34.19 % (79/231) in the age group of 21 years and above.

Table-I&II (Barkhan 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 cal-

Statistical analysis: Types of Infection

Age	*A*		*B*		*Total*
(Years)	*(fo)*	*(fe)*	*(fo)*	*(fe)*	
1-10	71	69.62	107	108.38	178
11-20	105	95.04	138	147.96	243
21 above	79	90.35	152	140.65	231
Total	255		397		652

$$X^2_{cal} = Ó \frac{(fo - fe)^2}{fe} = 4.1009$$

culated as 4.1009 and 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 calculated that there is no association between types of infection and age groups. Therefore, it can be said that any type of infection can occur in to any age group of people independently.

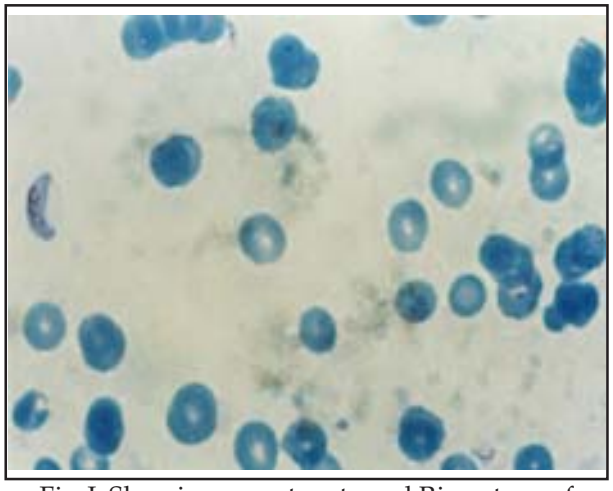

Fig-I: Showing gametocyte and Ring stage of *Plasmodium falciparum* in blood smear (100x) of malaria patient of Barkhan.

DISCUSSION

Yasinzai and Kakarsulemankhel[10,11] while conducting results on human malaria infection in urban and rural areas of Quetta district observed high prevalence of *P. falciparum* (55.55%: 75/135and 65.82%: 235/357) and a low incidence of *P. vivax* (44.44%: 60/135 and

Types of Infection

Age	*A*		*B*		*Total*
(Years)	*(fo)*	*(fe)*	*(fo)*	*(fe)*	
1-10	39	36.53	23	25.47	62
11-20	107	116.07	90	80.93	197
21 above	115	108.41	69	75.59	184
Total	261		182		443

$$X^2_{cal} = Ó \frac{(fo - fe)^2}{fe} = 3.1069$$

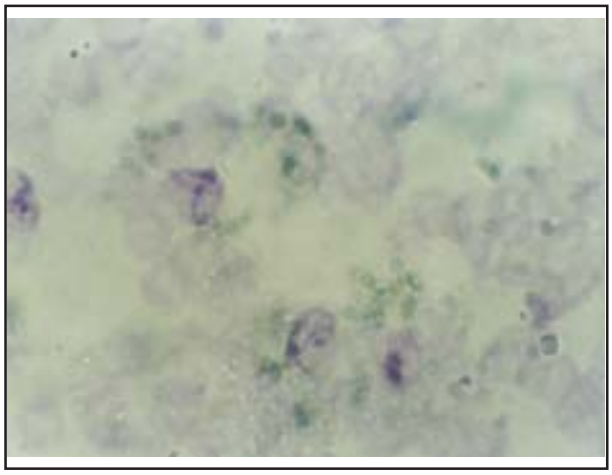

Fig-II: Showing gametocyte and Ring stage of *Plasmodium vivax* in blood smear (100x) of malaria patient of Barkhan.

Table-III: Month wise incidence of malaria infection in Kohlu.

Month	*No. of slides examined*	*Total No. of +ve*	*P. vivax (%)*	*P. falciparum (%)*
July, 2004	234	78	45 (57.69)	33 (42.30)
August	241	75	41 (54.66)	34 (45.33)
September	264	63	42 (66.66)	21 (33.33)
October	191	51	29 (56.86)	22 (43.13)
November	152	22	13 (59.09)	9 (40.90)
December	56	7	4 (57.14)	3 (42.85)
January	38	2	2 (100)	0
February	27	3	2 (66.66)	1 (33.33)
March	81	22	12 (54.54)	10 (45.45)
April	93	27	16 (59.25)	11 (40.74)
May	139	34	21 (61.76)	13 (38.23)
June, 2006	174	59	34 (57.62)	25 (42.37)
Total	1690	443	261 (58.91)	182 (41.08)

34.17%: 122/357 However, mixed infection of *P. vivax* and *P. falciparum* was not seen in patients of Quetta urban and rural areas. Akbar[15] and Hozhabri *et al*[16] while investigating malaria in children at Combined Military Hospital Multan, D.G. Khan, Muzaffargarh, adjoining areas of Balochistan; Sehwan area of Dadu, observed high prevalence of *P. falciparum* than *P. vivax* (65% vs 35%) respectively.

In Kohlu area (Table-III-IV), the over all incidence of Plasmodium slide positivity was 26.21% (443/1690) wherein *P. vivax* (Fig.-III) infection was found to highest (58.91%: 261/443) as compared with the *P. falciparum* (41.08%: 182/443) (Fig-IV). Among plasmodium slide positivity, children (1-10 years), 62.90% (39/62) were found to be positive for *P. vivax* and 37.09% (23/62) for *P. falciparum.* The commonest species of malarial parasites observed was *P. vivax* (Fig-III) with a highest incidence of 62.50% (115/184) in the age group of 21 years and above, 54.31% (107/197) in the age group of 11-20 years. However, *P. falciparum* was also found to be present with a low prevalence ratio of 45.68% (90/197), 37.50% (69/184) in the age groups of 11-20 years and 21 years and above respectively.

Table-III-IV (Kohlu 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 3.1069 and 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 observed that there is no association between types of infection and age groups. Therefore, it can be said that any type of infection can occur at any age group of people independently.

Similarly, *P. vivax* was found to be highest (60.5%: 52 out of 86 positive cases) in Multan district by Yar *et al.*[17] than *P. falciparum* (37.2%: 32 out of 86 positive cases). Similarly, Jan and Kiani[18] investigating haematozoan parasites in Kashmiri refugees settled in Muzzafarabad observed high prevalence of *P. vivax* (6.33%) than *P. falciparum* (0.67%).

However, mixed infection of *P. vivax* and *P. falciparum* was not observed in the present

Table-IV: Age wise over all incidence of malaria infection in Kohlu.

Age (Years)	*No. of slides examined*	*Total No. of +ve*	*Over all % Infection*	*Infection by P. vivax (%)*	*Infection by P. falciparum (%)*
1- 10	363	62	17.07	39 (62.90)	23 (37.09)
11- 20	670	197	29.40	107 (54.31)	90 (45.68)
21- above	657	184	28.00	115 (62.50)	69 (37.50)
Total	1690	443	26.21	261 (58.91)	182 (41.08)

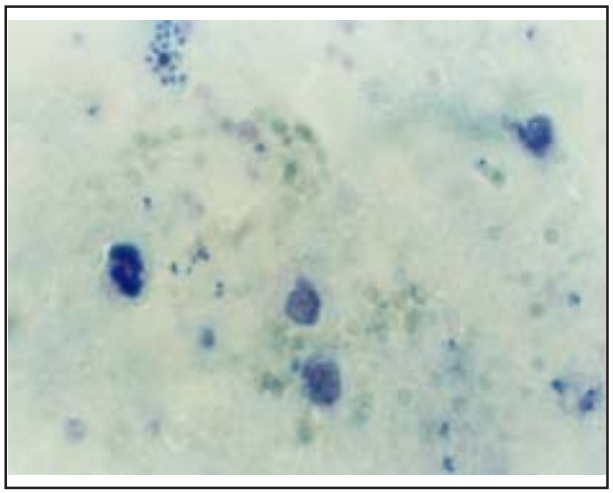

Fig-III: Showing gametocyte and ring stage of *Plasmodium vivax* in blood smear (100x) of malaria patient of Kohlu.

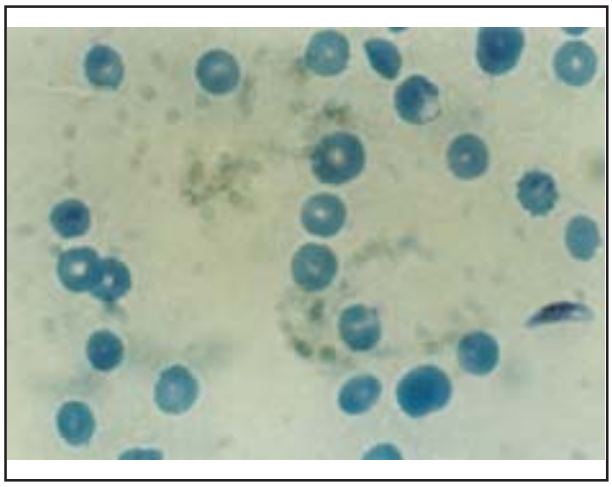

Fig-IV: Showing gametocyte and ring stage of *Plasmodium falciparum* in blood smear (100x) of malaria patient of Kohlu.

study, as mixed infection of 2.3% was observed in Multan district by Yar *et al.*[17] In the present study, no case of *P. malariae* or *P. ovale* infection was observed, as the same was also not observed by Yar *et al.*[17] in Multan.

In our study, the prevalence rate of 52.87% (579/1095) of *P. falciparum* poses a significant health hazard because not only *P. falciparum* infection but infection with *P. vivax* 47.12% (516/1095) may also lead to serious complications like cerebral malaria. We therefore conclude that infection with *P. falciparum* was found to be more prevalent in Barkhan are whereas *P. vivax* in Kohlu areas.

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