

Frequency of human malaria infection in south-eastern areas of Balochistan: District Lasbella

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ABSTRACT

Objective: To determine the frequency of malarial parasites in human population of District Lasbella areas of Pakistan.

Methodology: Malarial parasites were identified in the blood slides of suspected patients of the disease from July 2006 to June 2008 and encompassed 3471 subjects. Both Passive Case Detection (PCS) and Active Case Detection (ACD) methods were used for detection of malaria cases.

Results: Out of 3471 suspected cases of malaria, 1311 (37.7%) were found to be positive for malarial parasite in blood smear slides. Out of positive cases, 451 (34.4%) were identified as *Plasmodium vivax* infection and 860 (65.5%) cases with *P. falciparum*. Infection with *P. falciparum* was observed to be more prevalent in Lasbella district. There was no case of *Plasmodium malariae* and *P. ovale* observed in the present study.

Conclusion: Human malaria infection is quite frequent in Lasbella, which is the hottest area of Balochistan in Pakistan. In clinically suspected cases of malaria, high slide positivity rate is observed. The prevalence rate of 65.5% (860/1311) of *P. falciparum* poses a significant health hazard because not only *P. falciparum* but infection with *P. vivax* 34.4% (451/1311) may also lead to serious complications like cerebral malaria. This high frequency of human malaria infection should be of great concern for authorities at malaria control program in Pakistan.

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

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INTRODUCTION

Half of the world's population is at risk of malaria, and an estimated 243 million cases led to nearly 863000 deaths in 2008. In East Mediterranean Region, *P. falciparum* is the most dominant species of parasites in Djibouti, Saudi Arabia, Sudan and Yemen, but the majority of cases in Afghanistan and Pakistan, and almost all cases in Iran and Iraq are due to *P. vivax*.¹ In Pakistan, in 2006, Malaria Disease Surveillance Program registered 3.5 million

slides prepared and 127,825 confirmed cases of malaria with Annual Parasite Incidence of 0.8 cases per 1000 population. However, the actual cases load may be 5 times higher since public sector diagnosis facilities do not cover more than 20-30% of the attending patients and other 80% which get their treatment from Private sector.² Estimated number of Annual Malaria cases in Pakistan is 1.5 million.³ In 2004, lower malaria incidence was confined to two provinces: Punjab and Azad Jammu & Kashmir (AJK) and two provinces namely Balochistan and Federally Administered Areas (FATA) reported highest malaria incidence, while Sindh & NWFP provinces reported moderate as compared to two last malaria incidence.⁴

In 2000, in Sindh, 5.9% slide positivity rate (SPR) with 65% cases of *P. falciparum* and 35% of *P. vivax* in children, were observed.⁵ A review of *falciparum* malaria has also been published.⁶ High incidence of

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falciparum as compared to *vivax* (65% vs 35%) among 100 positive children for malaria at Baqai Medical University has been recorded.⁷ In 2006, 3.1% SPR with 58% *P. falciparum* and 42% *P. vivax* were observed.⁸ Mahmood et al⁹ studied 348 patients with fever at Civil Hospital and Ankle Seria Hospital Karachi from August 2003 to December, 2005 and observed 35% SPR, with *P. falciparum* 88.5% and *P. vivax* 9%. Nizamani et al¹⁰ studied the data of Provincial Malaria Control Program of Sindh and observed more than 68,000 slides reported positive for malarial parasites with an average slide positivity rate of 2.4 %. Average *P. falciparum* ratio in years 2004 and 2005 was 33% and 37.2% respectively. Annual parasite incidence was unacceptably high and *P. falciparum* ratio was found increasing in many districts of Sindh. Prevalence of malarial parasite in human blood in Karachi was studied and out of 2457 samples, 311 of the samples were found to be positive.¹¹

In south Punjab, 41% were found to be infected by *Plasmodium* species.¹² In NWFP, cerebral malaria was recorded more common in males (64%) and most vulnerable group was found pregnant women.¹³ *Falciparum* malaria is the major problem for Afghan refugees in NWFP.¹⁴

In Balochistan Province too, cerebral malaria is a major community problem. Khadim¹⁵ observed 11.7% positive cases of malaria from patients at CMH, Zhob. Malaria Control Program Balochistan (M.C.P.B.)¹⁶⁻¹⁸ observed slide positivity rate 5.7, 1.0, 5.3, 1.1, 9.6, 27.2, 13.3, 7.3, and 13.5% in 2004, 4.7, 0.5, 6.6, 1.5, 12.9, 32.4, 10.2, 7.5 and 13.5% in 2005, 5.7, 3.8, 17.5, 2.5, 42.2, 29.5, 7.6, 8, and 12.9% in 2006 in the districts of Lasbela, Qilla Abdullah, Mastung, Khuzdar, Kohlu, Zhob, Kharan, Sibi and Turbat. Shaikh et al¹⁹ studied endemicity of malaria in Quetta from January 1994 to December, 1998 and observed 34.8% positive smears, with 66.8% *P. vivax* and 30.7% *P. falciparum*. Farooq et al²⁰ studied 505

suspected malaria patients from district Khuzdar and observed higher prevalence of *P. falciparum* (69%) than of *P. vivax* (24%) and 7% mixed infection. Keeping in view the high mortality rate of malaria infection in Lasbela areas published in local news paper, the present investigation was carried out to know exactly the positivity rate and the dominant *Plasmodium* species. Lasbela District, basically an arid zone, known as a hypoendemic area of malaria and has recently experienced changes in ecosystem due to flood. This is perhaps the first study of its kind conducted on patients suffering from malaria in this area.

METHODOLOGY

A survey was conducted during July, 2006 to June, 2008 in the areas of district of Lasbela (6 localities) to record and screen the species of malarial parasites from the blood of human patients suffering from malaria.

Location: Lasbela (26° Lat, 66° Long, Height 130 M) is situated at the southern border of Balochistan Province, adjoining in the east with Karachi and Nawab Shah area of Sindh and in the west with Awaran and Khuzdar area (Balochistan) where cases of human malaria are very common.

Malaria cases were detected by adopting two ways. Passive Case Detection (PCD) Technique²¹ 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)²¹ in which home visits were made on monthly basis with the help of Malik/ Head 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 Paniker.²¹ Identification of species of malarial parasites were made

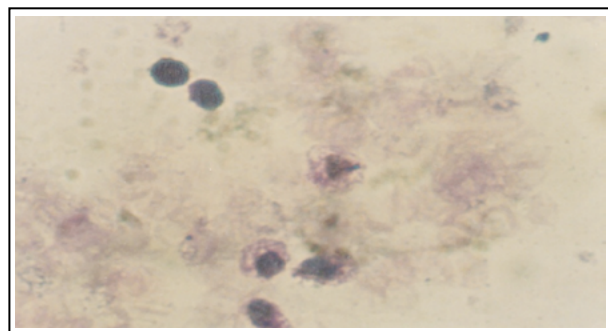


Fig.1: Showing gametocyte and Ring stage of *Plasmodium vivax* in blood smear (1000x) of malaria patient of Lasbela.

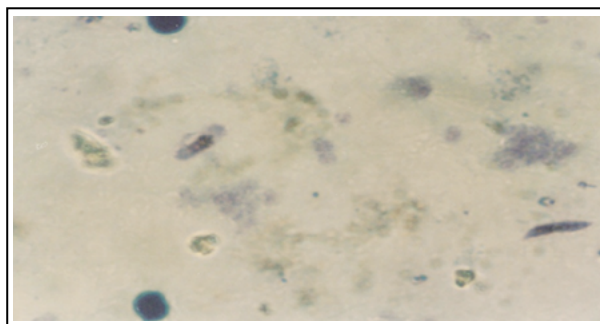


Fig.2: Showing gametocyte and ring stage of *Plasmodium falciparum* in blood smear (1000x) of malaria patient of Lasbela.

Table-I: Area-wise Malaria infection in District Lasbella.

S.#	Area	Slides examined	Total no. of +	<i>P. vivax</i> (%)	<i>P. falciparum</i> (%)
1.	Lasbella (City)	681	239	64(26.7)	175(73.2)
2.	Uthal	1135	459	155(33.7)	304(66.2)
3.	Muthkani	469	176	66(37.5)	110(62.5)
4.	Nakapubni	398	153	47(30.7)	106(69.2)
5.	Doriji	531	191	84(43.9)	107(56)
6.	Hub	257	93	35(37.6)	58(62.3)
Total		3471	1311	451(34.4)	860(65.5)

from the keys furnished by Paniker²¹ and Chiodini et al.²² Both Passive Case Detection (PCD) and Active Case Detection (ACD) methods were used for detection of malaria cases. In PCD 15 health facilities (3 District Hospital, 5 Basic Health Unit and 7 Private clinics) have collaborated. For ACD, 24 visits were conducted during two year study.

Statistical Analysis: Data was analyzed using SPSS version 11.0. Frequency along with percentages were used to describe the data. Chi-square test was applied to check the association between age and types of infection. P- value <0.05 was considered significant.

RESULTS

A total of 3471 blood smears were prepared from the age groups ranging from 1 year to 21 years and above residing in 6 different localities of Lasbella (Table-I). However, variations were observed among different localities having different environment and hygienic conditions.

In Lasbella area (Table-I), the over all incidence of Plasmodium slides positivity was 37.7%, whereas *Plasmodium falciparum* was observed to be highest (65.5%) as compared with that of *P. vivax* (34.4%). Among Plasmodium slide positivity, children (1-10 years), 68% were positive for *P. falciparum* and 31.9% for *P. vivax*. The commonest species of malarial parasites observed was *P. falciparum* (Fig.-I) with a highest incidence of 65.4% in the age group of 21 years and above, and 64.5% in the age group of 11-20 years. *P. vivax* (Fig-II) was also observed

Table-III: Age-wise Over all malaria infection in District Lasbella.

S #	Age (Year)	Slides Examined	No. of + ve	Overall % infection	<i>P. v.</i> (%)	<i>P. f.</i> (%)
1	1 - 10	911	291	31.9	93(31.9)	198(68)
2	11 - 20	1364	635	46.5	225(35.4)	410(64.5)
3	21 - Above	1196	385	32.1	133(34.5)	252(65.4)
Total		3471	1311	37.7	451(34.4)	860(65.5)

Table-II: Month-wise Malaria infection in District Lasbella.

Month	No. of Slides examined	Total no. of +	<i>P. vivax</i> (%)	<i>P. falciparum</i> (%)
July, 2006 -2008	227	88	27(30.6)	61(60.3)
August	279	113	41(36.2)	72(63.7)
September	248	92	25(27.1)	67(72.8)
October	217	78	37(47.4)	41(52.5)
November	349	121	55(45.4)	66(54.5)
December	261	102	30(29.4)	72(70.5)
January, 07- 08	321	134	38(28.3)	96(71.6)
February	377	116	40(34.4)	76(65.5)
March	317	128	36(28.1)	92(71.8)
April	389	144	49(34)	95(65.9)
May	316	127	49(38.5)	78(61.4)
June, 07- 08	170	68	24(35.2)	44(64.7)
Total	3471	1311	451(34.4)	860(65.5)

to be present in our study but comparatively with a less prevalence ratio of 35.4% in the age group of 11-20 years and 34.5% in the age group of 21 years and above.

Table- I (Lasbella area) was statistically analyzed to test whether there is any association between types of infection and age groups through χ^2 at 5% level of significance, χ^2 calculated.

Statistical analysis: Types of infection.

Age (Years)	A		B		Total
	(fo)	(fe)	(fo)	(fe)	
1-10	93	101.1	198	190.8	291
11-20	225	218.4	410	416.5	635
21 above	133	132.4	252	252.5	385
Total	451		860		1311

$$\chi^2_{\text{cal}} = \sum \frac{(fo - fe)^2}{fe} = 1.07198$$

As 1.07198 and compared with the table value of $\chi^2 = 5.991$. Since the calculated value of χ^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.

DISCUSSION

High percentage of *P. falciparum* (65.5%) observed in the present study poses a alarming situation in

Table-IV: Sex-wise malaria infection in District Lasbella.

Slides Examined	No. of + ve	No. of Male + ve (%)	No. of Female + ve (%)
3471	1311	1020(77.8)	291(22.1)

Lasbella area as the same species was also observed predominantly in Loralai-Musa Khel²³ (55.1%), Sanjavi²⁴ (84.6%), Children Hospital, Baqai Medical University, Karachi⁷ (65%) and Jahangara⁵ Sindh (65%). Falciparum malaria has high mortality as it causes complications like cerebral malaria, renal failure and algid malaria⁶. During present study in Lasbella district, high rate of slide positivity (37.7%) was observed as high SPR (96.2%) was also observed in children of Mansehra²⁵ than to the lower SPR, 24.1% in Sindh¹⁰ and 7.2% at Ayub Teaching Hospital Abbottabad.²⁶

However, mixed infection of *P. vivax* and *P. falciparum* was not seen in patients of Lasbella, and also not seen in Loralai-Musakhel²³, but observed (0.3%) in patients of Sanjavi²⁴ and also in patients of South Punjab.¹²

In Lasbella area (Table III and IV), the over all incidence of Plasmodium positivity was 33.7% wherein *P. falciparum* (Fig-1) infection was found to highest (65.5%) as compared with the *P. vivax* (34.4%) (Fig.2). Among plasmodium slide positivity, children (1-10 years) 68% were found to be positive for *P. falciparum* and 31.9% for *P. vivax*. The commonest species of malarial parasites observed was *P. falciparum* (Fig.1) with a highest incidence 65.4% in the age group of 21 years and above, 64.5% in the age group of 11-20 years. However, *P. vivax* was also found to be present with a low prevalence ratio of 35.4%, 34.5% in the age group of 11-20 years and 21 years above respectively. In Loralai-Musakhel districts, out of 7899 suspected cases, 28.8% was found positive smear with 71.8% *P. falciparum* and 28.2% *P. vivax*.²³ In the present study, no case of *P. malariae* and *P. ovale* infection was seen.

In our study, the prevalence rate of 65.5% of *P. falciparum* poses a significant health hazard because not only *P. falciparum* infection but infection with *P. vivax* 34.4% may also lead to serious complications like cerebral malaria. We, therefore, conclude that infection with *P. falciparum* was found to be more prevalent in district Lasbella area.

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