ORIGINAL ARTICLE

Prevalence of human malaria infection in Pakistani areas bordering with Iran

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Abstract

Objective: To study the prevalence of malarial infections in human population of district Panjgur in south-western Pakistan.

Methods: The cross-sectional study identified malarial parasites in the blood slides of 6119 suspected malaria patients from July 2006 to June 2008 through passive and active case detection methods. SPSS 11 was used for statistical analysis.

Results: Out of 6119 suspected cases of malaria, 2346 (38.3%) were found to be positive for malarial parasite on blood smear slides. Of these, 1868 (79.6%) cases were due to Plasmodium vivax infection, and 478 (20.3%) had P. falciparum. However, seasonal variation was also noted: P. vivax infection was the highest (n=131/144, 90.9%) in November and the lowest (n=83/176, 47.1%) in October. The prevalence was higher (n=1831, 78%) in males. Age-wise, the prevalence of the disease was 81.2% (n=334) and 80% (n=860) for age groups 1-10 years and 11-20 years. No case of P. malariae and P. ovale was detected in the study period. No association was found between types of infection and age groups.

Conclusion: Human malaria infection was quite frequent in the study region, which is one of the hottest areas of Balochistan, Pakistan. In clinically-suspected cases of malaria, there was a high slide positivity rate. The high prevalence rate of P. vivax poses a significant health hazard but P. falciparum also may lead to serious complications, including cerebral malaria.

Keywords: Malaria, PCD, ACD, Panjgur . (JPMA 63: 313; 2013)

Introduction

Half of the world's population is still at risk of malaria. In 2008, an estimated 243 million cases were reported and nearly 863000 deaths were attributed to the disease. In the East Mediterranean region, Plasmodium (P.) falciparum is the dominant species 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 infection.[1] In 2006, the Malaria Disease Surveillance Programme in Pakistan registered 3.5 million slides and 127,825 confirmed cases of malaria with an annual parasite incidence (API) of 0.8 cases per 1000 population. However, the actual case load is estimated to be 5 times higher since public-sector diagnostic facilities cover 20-30% of the patient load, and the remaining get their treatment from the private sector.[2] The estimated number of annual malaria cases in Pakistan is 1.5 million.[3]

In 2004, Punjab and the Azad Jammu and Kashmir (AJK) reported the lowest figures of malaria cases while Balochistan and the Federally Administered Tribal Areas (FATA) reported the highest frequency. Sindh and Khyber-Pakhtunkhwa reported moderate figures in the same period.[4]

In Balochistan, cerebral malaria is a major community problem. Khadim observed 11.7% positive cases of malaria from patients at the Combined Military Hospital in Zhob.[5] The Malaria Control Programme Balochistan (MCPB) calculated the slide positivity rate (SPR) in nine districts and their results for each year (2004, -05 and -06) were: Lasbella (5.7, 4.7 & 5.7%); Qilla Abdullah (1.0, 0.5 & 3.8%); Mastung (5.3, 6.6 & 17.5%); Khuzdar (1.1, 1.5 & 2.5%); Kohlu (9.6, 12.9 & 42.2%); Zhob (27.2, 32.4 & 42.2%); Kharan (13.3, 10.2 & 29.5%); Sibi (7.3, 7.5 & 7.68%) and Turbat (13.5, 13.5 & 12.9%).[6-8]

Shaikh et al studied the 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.[9] Farooq et al 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.[10] Keeping in view the high mortality reported in local newspapers due to malaria in Panjgur , the present investigation was carried out to assess the positivity rate and the dominant Plasmodium species. This is perhaps the first study of its kind conducted on patients suffering from malaria in this area.

Patients and methods

The cross-sectional survey was conducted between July

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2006 and June 2008 in nine locations in Panjgur district, which is situated on the western border of Balochistan province bordering Iran, and has a population of about 380,001.[11]

Malaria cases were detected by two methods: passive case detection (PCD) technique, wherein blood films were taken from the patients presenting themselves at a health station with symptoms of shivering and fever or a history suggestive of malaria; and active case detection (ACD) in which home visits were made on a monthly basis with the help of the local chieftain to persons with signs or symptoms of malaria and both thin and thick blood films were prepared.[12] In PCD, 10 health facilities (1 district hospital, 3 basic health units and 6 private clinics) collaborated, and for ACD, 24 visits were conducted during the two-year study period. Blood slides were taken back to the laboratory where they were stained with Giemsa stain according to the technique described by Paniker.[12] Identification of the species of malarial parasites was made from the keys furnished by Chiodini et al[13] and Paniker.[12]

Data were analysed using SPSS version 11. 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, and $p<0.05$ was considered significant.

Results

A total of 6119 blood smears (PCD: 4833, ACD: 1286) were prepared from subjects in three age groups (1-10 years, 11-20 years, and 21 years and above) (Table-1). There was variation in disease in different locations depending on the environmental and hygienic conditions.

Table-1: Area-wise slide positivity rate of malaria infection in Panjgur district

S. No.	Area	Slides examined		No. of positive cases		*P. vivax*		*P. falciparum*	
		PCD	ACD	PCD (%)	ACD (%)	PCD	ACD	PCD	ACD
1.	Panjgur city	1433	437	544 (37.9)	154 (35.2)	523	142	21	12
2.	Tusp	571	125	227 (39.7)	40 (32)	146	32	81	8
3.	Gwargo	607	194	223 (36.7)	78 (40.2)	163	67	60	11
4.	Shahbaz Kalat	366	81	191 (52.1)	19 (23.4)	158	13	33	6
5.	Washup	506	153	176 (34.7)	73 (47.7)	134	52	42	21
6.	Paroom	433	110	145 (33.4)	49 (44.5)	95	40	50	9
7.	Bizban Chah	347	82	147 (42.3)	21 (25.6)	121	16	26	5
8.	Guchak	249	56	97 (38.9)	16 (28.5)	68	12	29	4
9.	Rahi Nagor	321	48	120 (37.3)	26 (54.1)	70	16	50	10
	Total	4833	1286	1870 (38.6)	476 (37)	1478 (79%)	390 (81.9%)	392 (20.9%)	86 (18%)

PCD: Passive case detection
ACD: Active case detection

Table-2: Month-wise slide positivity rate

Month	Slides examined		No. of positive cases		*P. vivax*		*P. falciparum*	
	PCD	ACD	PCD (%)	ACD (%)	PCD	ACD	PCD	ACD
July, 2006-08	498	134	208 (41.7)	41 (30.5)	165	37	43	4
August	525	163	237 (45.1)	59 (36.1)	180	53	57	6
September	511	192	238 (46.5)	73 (38)	193	60	43	13
October	480	114	138 (28.7)	38 (33.3)	110	32	28	6
November	344	67	123 (35.7)	21 (31.3)	99	17	24	4
December	288	81	79 (27.4)	26 (32)	65	18	14	8
January,07-08	255	57	62 (24.3)	11 (19.2)	52	8	10	3
February	231	50	54 (23.3)	13 (26)	47	8	7	5
March	284	77	128 (45)	37 (48)	89	28	39	9
April	395	97	158 (39.8)	31 (31.9)	122	25	36	6
May	510	109	209 (40.9)	60 (55)	169	46	40	14
June, 07-08	512	145	236 (46)	66 (45.5)	187	58	49	8
Total	4833	1286	1870 (38.6)	476 (37)	1478 (79%)	390 (81.9%)	392 (20.9%)	86 (18%)

PCD: Passive case detection
ACD: Active case detection

Table-3: Age-wise slide positivity rate

S. No.	Age (Years)	Slides examined		No. of positive cases		*P. vivax*		*P. falciparum*	
		PCD	ACD	PCD (%)	ACD (%)	PCD	ACD	PCD	ACD
1.	1-10	1052	287	321 (30.5)	90 (31.3)	253	71	68	19
2.	11- 20	1867	611	839 (44.9)	235 (38.4)	665	199	174	36
3.	21. above	1914	388	710 (37)	151 (38.9)	560	120	150	31
	Total	4833	1286	1870 (38.6)	476 (37)	1478	390	392	86
						(79%)	(81.9%)	(20.9%)	(18%)

PCD: Passive case detection
ACD: Active case detection

Table-4: Gender-wise slide positivity rate

Slides examined		No. of positive cases			Males + ve					Females + ve					
PCD	ACD	PCD (%)	ACD (%)	+ ve (%)	PCD P. v.	P. f.	+ ve (%)	ACD P. v.	P. f.	+ ve (%)	PCD P. v.	P. f.	+ ve (%)	ACD P.v.	P.f.
4833	1286	1870 (38.7)	476 (33)	1539 (82.3)	1188	351	292 (61.3)	216	76	402 (21.5)	341	61	113 (23.7)	86	27

PCD: Passive case detection
ACD: Active case detection
P. v: P. vivax P. f: P. falciparum

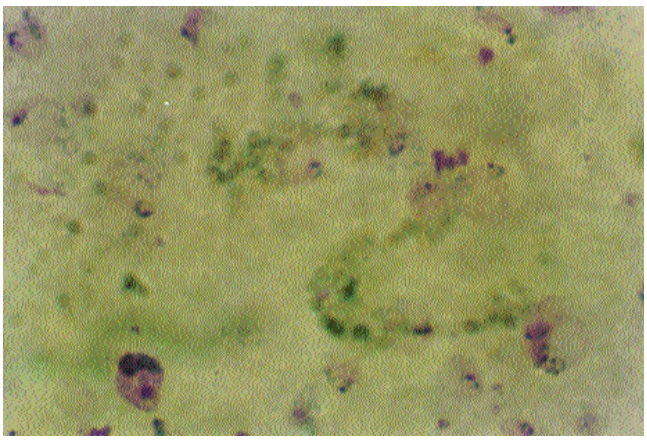

Figure-1: Gametocyte and ring stages of *P. vivax* in blood smear (1000x) of a malaria patient.

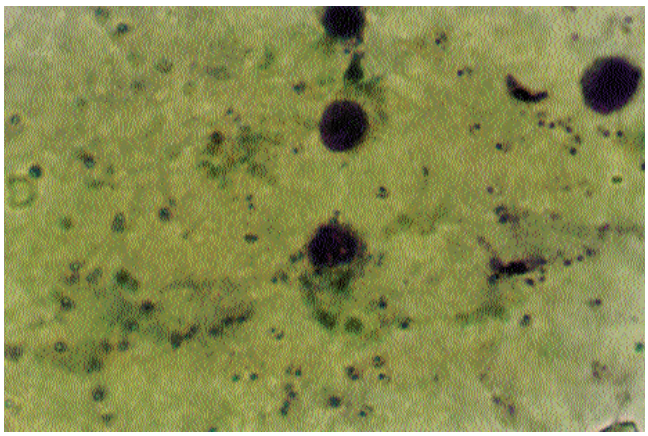

Figure-2: Gametocyte and ring stages of *P. falciparum* in blood smear (1000x) of a malaria patient.

The overall SPR in Panjgur district (Tables-1-3) was observed to be 38.3% (2346/6119). Of the total cases, 79.6% (1868/2346) were of P. vivax (Figure-1) while 20.3% (478/2346) were of P. falciparum (Figure-2). Mixed infections were not seen in the present study nor were any other species observed.

The SPR for those aged 1-10 years was 30.6% (411/1339); for 11-20 years it was 43.3% (1074/2478); and for those 21 years and above it was 37.4% (861/2302). P. vivax infection was present in 81.2% (334/411) of those aged 1-10 years, 80% (860/1073) of those aged11-20 years, and 78.2% (674/861) in the age group 21 years and above. The rest of the cases in all age groups were infected with P. falciparum. However, the calculated value of chi-square (1.77485) was less than the table value (5.991), which showed that there was no association between the types of infection and age groups. Any type of infection could occur at any age.

A seasonal variation was also noted with 90.9% (131/144) cases of P. vivax recorded in November, and the lowest 47.1% (83/176) in October. Of those infected with P. vivax , 78% (1831/2346) were males while 21.9% (515/2346) were females (Table-4).

Discussion

In Pakistan, malaria is a major health hazard. In 2000, 5.9% SPR

with 65% cases of P. falciparum and 35% of P. vivax in children across Sindh were observed.[14] A review of falciparum malaria has also been published.[15] High incidence of P. falciparum compared to P. vivax (65% vs 35%) among 100 children positive for malaria at a university hospital has been recorded.[16] In 2006, 3.1% SPR (58% P. falciparum and 42% P. vivax) was also observed.[17] Mahmood et al[18] studied 348 patients with fever at two hospitals in Karachi from August 2003 to December 2005, and reported 35% SPR (P. falciparum 88.5% and P. vivax 9%). Nizamani et al[19] studied the data of the Sindh Malaria Control Programme and observed more than 68,000 positive slides for malarial parasites with an average SPR of 2.4%. Average P. falciparum ratio in years 2004 and 2005 were 33% and 37.2% respectively. Annual parasite incidence was unacceptably high and P. falciparum ratio was found to be increasing in many districts of Sindh. Prevalence of malarial parasite in human blood in Karachi was studied and out of 2457 samples, 311 were found to be positive.[20] In southern Punjab, 41% were found to be infected by plasmodium species.[21] In Khyber-Pakhtunkhwa, cerebral malaria was more common among males (64%), and the most vulnerable were pregnant women.[22] Falciparum malaria is a major problem among Afghan refugees in Khyber-Pakhtunkhwa.[23]

During the present study, no case of P. malariae and P. ovale was observed. The same was the case in a study done in Multan.[24] High rate of P. vivax (60.5%) was also observed,[24] and the highest P. vivax (90.4%) was observed in Kashmiri refugees settled in Muzaffarabad.[25]

MCPB[6] observed high SPR (88.5%) of P. vivax in Ziarat. High SPR of P. vivax was also observed in other parts of Balochistan viz Kohlu and Ziarat.[27] In southern Punjab, P. vivax was found to be more prevalent (39.0%) than P. falciparum (36.6%).[21] In Karachi, P. falciparum was observed to be dominating (90.99%) compared to P. vivax (9.0%).[20]

Conclusion

In clinically suspected cases of malaria, the SPR was high. The high prevalence of P. vivax poses a significant health hazard in Panjgur district, and should be of great concern for the Malaria Control Programme in Pakistan.

Acknowledgement

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