

PREVALENCE OF *PLASMODIUM FALCIPARUM*, MALARIAL PARASITE IN MUZAFFARGARH DISTRICT, PUNJAB-PAKISTAN: A TWO YEAR STUDY

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ABSTRACT: Malaria is well known for its fatalities worldwide and in case of Pakistan; it is still endemic in many areas. Two species of Plasmodium namely the *Plasmodium vivax* and the *Plasmodium falciparum* are reported from Pakistan. *P. vivax* is too widespread, creating lots of morbidities across the country. *P. falciparum*, on the other hand, is though comparatively narrow in its infectious volume but yet a serious cause of mortalities in Pakistan. A two year survey was conducted from November-2008 to October-2010 in a high malaria-hit district Muzaffargarh. Thick and thin blood smears were made at the Rural Health Center (RHC), Sinawan, where the microscopic examination was carried out. The overall reported cases at RHC included 10,028 suspected malaria cases, of which, 208 were confirmed as *P. falciparum* patients. It was made out that malaria cases reported in age group (16-30) years were significantly higher ($P < 0.001$), among which males were victimized significantly more ($P < 0.001$) than the females. The overall *P. falciparum* positivity rate throughout the survey interval was 2.07%. It was 0.47% in the 1st year of the research, while in the 2nd year it increased significantly ($P < 0.001$) and reached to 2.69%. This rapid increase was caused by the heavy floods hitting Punjab during the research span. The data were analyzed through software SPSS version 19 and chisquare analysis was applied. Regression analysis was used to predict percentage on the basis of age group. This research work evidences that *P. falciparum* is steadily becoming more dangerous and deadly in rural areas of Punjab in general, and in the Muzaffargarh district in particular. It is therefore highly necessary to take immediate and effective measures to minimize death toll in these areas.

Key words: Prevalence, Malaria, *Plasmodium falciparum*, Muzaffargarh, Pakistan.

INTRODUCTION

Human race has been struggling against the parasites for centuries and among these parasites *Plasmodium* is still one of the most threatening and causing malaria worldwide (Schlitzer, 2007). It is globally estimated that 243 million malaria cases are reported every year. More awe-awakening figures tell us that approximately 8, 63,000 deaths were caused by malaria in 2008 (WHO, 2009a). In Eastern Mediterranean Region (EMR), there were 5.7 million confirmed malaria cases, of which 17% cases were registered in Pakistan (WHO, 2010a). In 2010, suspected cases reported from Pakistan were 3, 00000, owing to the flood, (WHO, 2011). There are four different species of *Plasmodium*: *P. falciparum*, *P. vivax*, *P. malariae* and *P. ovale* that cause human malaria (Mohapatra *et al.*, 2008). Among these, *P. falciparum* is the most mortal (Mangold *et al.*, 2005). In Pakistan, two species of *Plasmodium* are rife: *P. vivax* (74%), the most prevalent, and *P. falciparum* (26%) the most dangerous (WHO, 2009^b). Kakar *et al.* (2010) reported that malaria is a major cause of morbidity in many areas of Pakistan. Main factors involved in its

transmission are the improper diagnosis and control measures taken against vectors species.

With the prevailing situation of malaria in perspective, this study was designed to assess the present pace of the prevalence of *P. falciparum* in Muzaffargarh district, Punjab.

MATERIALS AND METHODS

Muzaffargarh is located between the two rivers- Chenab in the east and Indus in the west, and is highly endemic for malaria (Personal communication Directorate General Health Punjab, Pakistan): In the Rural Health Center (RHC) Sinawan, thesil Kot Adu, district Muzaffargarh had repeatedly registered a big number of malaria cases during the past few years due to this reason study was planned and conducted from November 2008-October 2010.

Malaria transmission affects Pakistan through the whole year generally, but the most cases are reported in the period between September and November, following the monsoon season. Blood samples were collected from the individuals who had malaria specific symptoms such as fever, persistent headache, vomiting

etc. Patients' consent was asked for prior to the sampling process, which was also reviewed and approved by the ethical committees of the country's Ministry of Health. Finger pricked blood was used for slide preparation. Thick and thin blood smears were prepared and stained by Giemsa stain (3% solution in 7.2 pH phosphate buffer) (WHO, 1991). Microscopic examination of thick and thin films was carried out to identify *P. falciparum*. The data were analyzed through software SPSS version 19 and chisquare analysis was applied to find significant differences. Regression analysis was used to predict percentage on the basis of age group.

RESULTS AND DISCUSSION

Falciparum malaria has high mortality rate as it causes severe complications such as cerebral malaria, renal failure and algid malaria (Bhalli and Samiullah, 2001). The present research work was conducted during Nov-2008 to Oct-2010. Finger pricked whole blood specimens were taken from 10,082 malaria suspected people (ageing 1-60 years) in Rural Health Center (RHC) Sinawan, Muzaffargarh. The prevalence ratio of *P. falciparum* in the population is shown in table 1. The results had confirmed that among the suspected malaria cases, 208 were actually victimized by the *P. falciparum*. Further analysis told us that the maximum number of cases (45.67%) were observed in the age group (16-30) years, followed by 37.50% in the age group (6-15) years while 12.50, 3.37 and 0.96% cases were confirmed in the age groups of 30-45, >45 and 1-5 respectively. The youth was the most affected class. Similarly, Yar *et al.* (1998) reported the prevalence of malarial parasites in Multan district and observed that *P. falciparum* was less prevalent than *P. vivax*. They also found in their study that adults were more vulnerable to the disease than the other age groups. Jan and Kiani (2001) also observed the less frequency of *P. falciparum* among the Kishmiri refugees and most of malaria cases were registered in the adults (>21 years). However, in the present study, the maximum people affected were those who aged between 16 and 30 years.

The present study provides evidence that, males were significantly ($p \leq 0.001$) more likely to catch the disease than the females, as among the reported cases, 68.27% were males, whereas only 31.73% patients were women, as shown in table 2 and figure 1. This percentage might have been influenced by some social restrictions on females to avail the diagnostic facilities, as reported by Rana (2009). In the 1st year of this study 2779 suspected patients were reported and only 13 were confirmed as positive for *P. falciparum* infection. *P. falciparum* positivity rate (FPR) was 0.475%. While in the 2nd year of study 7249 suspected cases were reported, of which 195 were testified to be positive. In this year, FPR increased and reached to 2.69%, significantly higher ($p \leq$

0.001) than 1st year (table 1.) This rapid rise was caused by the flood disaster in Punjab. Similar situation was reported from Sind during 2006 and from Baluchistan during 2009, where a sharp spike of malarial incidence was evidenced after floods (WHO, 2010^b). All round the world, the wake of flooding epidemics are common as it has been reported from Costa Rica (1991), India (1999) and Dominican Republic (2004) (Singh *et al.* 1997; WHO 2010^a). There are various other factors begetting the increasing incidence of *P. falciparum* in Pakistan; one of them is the refugees dwelling here from Afghanistan, a country endemic for *P. falciparum* (WHO, 2001). These refugees move freely in Pakistan and across the border, carrying *P. falciparum* and transferring it to the people. Increased malariogenic potential of Pakistanis is also due to monsoon rains, vast irrigation network and the poverty (WHO, 2005).

Table 1. Prevalence of *Plasmodium falciparum* in Muzaffargarh district Punjab, Pakistan

Study period	Slides examined	P.f	FPR
Nov 2008-Oct 2009	2779	13	0.47
Nov 2009-Oct 2010	7249	195	2.69
Total	10028	208	2.07
$P<0.001$		$P. f=Plasmodium falciparum$	
FPR= <i>P. falciparum</i> positivity rate			

Table 2. Demographic characteristics of *Plasmodium falciparum* patients.

Years	N (%age)
1-5	2 (0.96)
6-15	78 (37.50)
16-30	95 (45.67)
31-45	26 (12.50)
46-60	7 (3.37)
Females	72 (33.64)
Males	142 (66.35)
Total	208
$P < 0.001$	

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