REPORT

Incidence of malaria in the population of Korangi creek area, Karachi, Pakistan

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Abstract: Parasites lives on host organism with some or complete metabolic dependence on it, while the haemoparasites inhabit and nourished from blood cells of the host. The current investigation evaluated to raise awareness of blood parasite (*Plasmodium* spp.) infection in Korangi creek, Karachi, population and to know as to which *Plasmodium* species was most prevalent. One year data was collected from different hospitals and laboratories of the Korangi creek area, blood slides were prepared under the microscope. Four hundred and eighty one infected slides with *Plasmodium* were observed amongst them 396 (82.32 percent) had *P. vivax* and 85 (17.67 percent) had *P. falciparum* infection. The rate of infection did not vary with gender but had a signification association with age. Highest incidence was recorded in age group 16-40 years for both *P. vivax* and *P. falciparum* followed by age group 1-15 years in *P. vivax* and age group 41-60 years for *P. falciparum*. It was suggested that protective measures are required to overcome disease that include covering arms and legs, using repellents mosquito nets along with proper dispensing and appropriate treatment.

Keywords: Haemoparasite, malaria, *Plasmodium vivax*, *P. falciparum*, Karachi.

INTRODUCTION

Malaria is an important, widespread fatal infectious disease (Kachur *et al.* 2008). It is caused by *Plasmodium*, which is a genus of parasitic alveolates. Annually, 300-500 million malaria cases occur. Drug resistance, poor sanitation, population movement, climatic change and improper development activities are the cause of spread of malaria.

Significant amount of work has been conducted regarding regional malaria infection level in Pakistan (Zaidi, 2015; Pervez and Shah 1989; Idris *et al.*, 2007; Soomro *et al.* 2010 etc.). Bilal *et al.* (2013) conducted a survey in Arafat Town a slum area of Karachi and found that the inhabitants were positive towards control of malaria, but insufficient knowledge, which could probably be due to low literacy rate or poor socio-economic condition.

Blood parasites are also transferred during needle exchange or blood transfusion or by a vector. Blood protozoa of major clinical significance include *Plasmodium* spp. the two major species are *P. vivax* and *P. falciparum*, which are endemic to Pakistan. A review of previous studies disclosed that the prevalence of *P. vivax* and *P. falciparum* in Pakistan were 74 and 26 percent, respectively (WHO 2009).

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It is mostly associated with poverty and consequently has a negative effect on economic development (Worrall, *et al.* 2005). The typical symptoms are vomiting, headache, fever, feeling tired and if untreated coma and death. Sandlund *et al.* (2013) suggested that in children malaria predisposes to concurrent bacteremia, of ten with severe outcomes in endemic areas and supported a restrictive antibiotic policy in malaria patient travelers. Mehmood and Ejaz (2012) reported that the debilitating impact of *P. vivax* was high in Karachi. Severe *P. vivax* malaria can be contained through aggressive resuscitation and proper therapy. Sensitivity and awareness course must be adopted amongst the caretakers.

Plasmodium spp.

The genus *Plasmodium* has more than 200 species currently recognized.

The main species of *Plasmodium* that infect humans include:

Plasmodium falciparum (causative agent of malignant tertian malaria)

Plasmodium vivax (causative agent of benign tertian malaria)

Plasmodium ovale (causes less frequent, cause of benign tertian malaria)

Plasmodium malariae (cause of benign quartan malaria).

But the predominant in Pakistan are *P. vivax* and *P. falciparum* (WHO 2009).

Plasmodium vivax

It is a human parasite which is most common and abundantly distributed causing recurring type of malaria (Benign tertian), while *P. vivax* is one of the six species that are malarial parasites that usually attack humans. Though it is less virulent compared to *Plasmodium falciparum* which is known to be the deadliest. However *P. vivax* can often lead to disease and even death. The carrier *P. vivax* is the female *Anopheles*. This is the only female mosquito species that bites.

Plasmodium falciparum

It is a common species of *Plasmodium* in study areas that cause malaria in humans. Like the other species of *Plamodium* it is also transmitted by in the female *Anopheles* mosquito. This species causes the most harmful form of malaria with high rates of complication and mortality. According to a conservative estimate there were 247 million human malarial infections of which 98 percent were in Africa. Most of the death with malarial parasite are caused by *P. falciparum*.

MATERIALS AND METHODS

Infected blood samples from malarial patients were collected from the different hospitals and diagnostic laboratories of the Korangi creek area, Karachi, during the year 2013. Blood slides were prepared and examined in the Parasitology laboratory University of Karachi, Pakistan, after preparation of questionnaire to collect information regarding name, sex, age and type of infection. As the blood is not processed immediately, anticoagulants were used to preserve. The anticoagulant which was used in this study were EDTA and Heparin. Permanent stained blood smear is essential for accurate identification of blood parasites. Both thin and thick smears stained with Leishman and Giemsa or Wright's stain were used. After preparation of blood slides and staining, the slides were examined under the microscope having magnification of 400X.The relation between age and type of infection was evaluated using a test of association between groups. Similarly, incidence of infection in relation to gender was also estimated using chi-square test of association.

RESULTS

When the incidence was tested against the age groups, it was found that it had a significant association (chi-square =22.205, G=16.58, $p<0.001$) (table 1). The test performed between incidence of infection and the gender gave a non-significant result (chi-square =0.669, with one df, G =0.665) (non-significant (table 2).

In the given data, 481 positive patients were examined. Out of which, 396 (82.32%) were infected with *P. vivax* and 85 (17.67%) were infected with *P. falciparum*.

DISCUSSION

Martinsen *et al*. (2008) reported *Plasmodium* is a well recognized taxonomic group that has presumably co-evolved with particular mosquito taxon as a vector. It is an endemic infection in Pakistan. This research is based on one year data analysis of the infected patients amongst the population of Korangi creek area, Karachi. The data showed that the malaria is the most common blood parasitic diseases involving individuals of the all ages and gender. The data is not an actual fig. because the infection can be diagnosed by the symptoms and the patients take remedies at the home rather than to visit the hospitals, or avoid blood test. Kakar *et al*. (2010). suggested that malaria is a major cause of morbidity in many areas of Pakistan. D'Acremont *et al*. (2010). stated that malaria is prevalent in about 100 different countries, which suggests that approximately 40% of the world population is at risk of being infected by one of the malarial parasite.

Plasmodium parasites invade the red blood cells and cause febrile fever, intestinal malaria, thrombus formation in the capillaries of the small intestine, which cause mucosal infarction. In fatal hemorrhage malaria, bleeding occurs from the nasal mucosa, stomach, pancreas, small intestine and the rectum. Patients infected with *P. falciparum* sometimes leads to Black water fever which is a complication of malarial infection in which RBC's burst in bloodstream. Haemoglobinemia, jaundice and fever are the three important signs of Black water fever.

The clinical features of the disease involve febrile paroxysm, anemia and splenomegaly. It also causes pernicious malaria with its three main types: cerebral, algid and septicemic malaria.

On a worldwide basis 243 million cases of malaria are reported each year. In Eastern Mediterranean region, 5.7 million confirmed malaria cases have been observed out of which 17% cases were recognized in Pakistan (WHO 2010). Overwhelming literature suggest that the malaria parasite *P. vivax* is endemic in West and Central Africa (Culleton and Carter, 2012). *P. vivax* occurs globally and thrives in both temperate and tropical climates (Battle *et al*., 2012). Douglas *et al*., (2012). suggested that the *Plasmodium vivax* threatens nearly half the world's population.

Prevalence of *P. vivax* ranged from 2.4% in Punjab to 10.8% in Sindh and prevalence of *P. falciparum* ranged from 0.1% in Islamabad to 3.8% in Balochistan (Khattak *et al*., 2013). The present research regarding malaria indicated that the *P. vivax* is the most common parasite in Korangi creek, Karachi. Infection of *Plasmodium vivax* is almost four times higher than the *Plasmodium falciparum*.

Rahman *et al*. (2017) suggested that *P. vivax* was most prevalent 98.93% in Shangla, KPK. Contrary to present

Table 1: Incidence of infection on the basis of age group

Infection	Age group I (1-15 years)	%	Age group II (16-40 years)	%	Age group III (41-60 years)	%
P. vivax	63	15.90	321	81.06	12	3.02
P. falciparum	8	9.41	65	76.47	12	14.11

Chi-square = 22.205 with 2df
G = 16.58 ($p < 0.001$)

Table 2: Incidence of infection in gender

Gender	*P. vivax*		*P. falciparum*	
Male	238	60.10%	47	55.29%
Female	158	39.89%	38	44.70%

Chi-square = 0.669 n.s. with 1df
G = 0.665 n.s.

findings in earlier study, it was reported that *P. falciparum* was more frequent in Sindh, Balochistan and KPK while *P. vivax* was more prevalent in Punjab (Malik *et al*. 2013).

In an earlier finding Yasinzai and Kakarsulemankhel (2013) reported 6119 suspected cases of malaria, out of which 2346 were found to be positive. Of these, 1868 (76.6%) were infected with *P. vivax* and 478 (20.03%) were with *P. falciparum*. The same researchers reported that out of 2432 malaria positive patients in Balochistan, 2157 (86.69%) were identified as *P. vivax* and 275 (11.30%) as *P. falciparum*. In the present study in male 60.10% had *P. vivax* infection, while 55.29% had *P. falciparum* infection. In female 39.89% had *P. vivax* infection and 44.70% *P. falciparum* infection. The incidence of infection and gender was non- significant. Sahar *et al*. (2012). found in their study that males were more prone to have malarial as compared to females.

Unfortunately, patients visit untrained people at the pharmacies. Proper training of Dispensers should be undertaken and complete history of the patient should be recorded for proper counselling in this particular area. Protective measures include covering arms and legs, using repellents and mosquito nets.

Reference to physician for proper treatment of malaria is necessary, which is usually with chloriquine plus primaquine along with anti-pyretic drugs.

CONCLUSION

It is concluded from the present study that the *Plasmodium vivax* and the *Plasmodium falciparum* are the two main species of Protozoan blood parasites causing malaria found in the patients of Korangi creek area. When incidence of infection was tested against age group, it was found that it had a significant association. The highest incidence was recorded in age group II (16-40 years). The incidence of infection and the gender gave non-significant results. Protective measures are required to decrease the rate of infection.

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