

Research Article

Incidence Rate of *Plasmodium vivax* and *Plasmodium falciparum* in Kasur-Pakistan

Sher SF* and Hussain N

Department of Microbiology and Molecular Genetics,
University of the Punjab, Quaid-e-Azam Campus, Lahore,
Pakistan

***Corresponding author:** Sonia Falak Sher,
Department of Microbiology and Molecular Genetics,
University of the Punjab, Quaid-e-Azam Campus, Lahore,
Pakistan

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Abstract

Malaria is a disease, which is caused by the bite of the female Anopheles mosquito. The major aim of this study was to calculate the incidence rate of *Plasmodium vivax* and *Plasmodium falciparum* in Kasur. A total of about 20 blood samples were collected from the individuals suspected of having malaria during August 2017 to December 2017. Immuno-chromatographic kit was used for malaria testing. About 10 μ l of serum was dispensed in the sample hole on the immunochromatographic kit. After 10-15 minutes, the results were noted down. The results showed that from the 20 individuals, only 5 were malaria positive. These 5 individuals were suffered from *Plasmodium vivax*. The incidence rate of malaria calculated from this study was 25% because 5 patients gave positive results while the rest of the 75% or 15 patients gave negative results.

Keywords: Anopheles; *Plasmodium*; Prevalence; *vivax*; *falciparum*; Kasur; Immunochromatographic kit

Introduction

Malaria, including Pakistan, is present in about 109 countries. It is a dreadful as well as disastrous disease all around the world. About 3.3 billion people suffered from malaria each year [1]. Malaria becomes a major health problem after the discovery of parasite of malaria and its role in the transmission of malaria from one individual to another individual [2]. In Pakistan, two major species of *Plasmodium* are responsible for malaria, which are *Plasmodium vivax* and *Plasmodium falciparum* [3-5]. About 64% of the infections are caused by *Plasmodium vivax* and the remaining 36% are caused by *Plasmodium falciparum* in Pakistan. Seasonal changes attribute a major role in the spreading of malaria. The infections of *Plasmodium vivax* spread from June to September and again from April to June. However, the infections of *Plasmodium falciparum* spread from August to December. These are the prevalence's which are present in Pakistan. *Plasmodium vivax* is responsible for most of the infections present in Pakistan, but the ratio of infections by *Plasmodium falciparum* also gradually increases [6]. The main aims and objectives of this work were to identify malarial species present in Kasur and to diagnose patients suspected of having malaria. This work may be proved helpful in providing awareness about the preventive measures related to malaria.

Materials and Methods

A total of about 20 samples were collected from Kanganpur-Kasur. Serum was separated from the blood by centrifugation. About 10 μ l of serum was taken into the capillary tube. Sample was poured into the sample hole on the immuno-chromatographic kit. The catalog number of the kit was R0111C. Two drops of sample diluent were added into the sample well immediately after dispensing the specimen. After 15-20 minutes, the results were noted.

Results and Discussion

Blood samples were collected from the 20 individuals. From the

20 individuals, only 5 individuals gave positive results. Two of them were females and 3 were males. They were suffering from *Plasmodium vivax* (Figure 1).

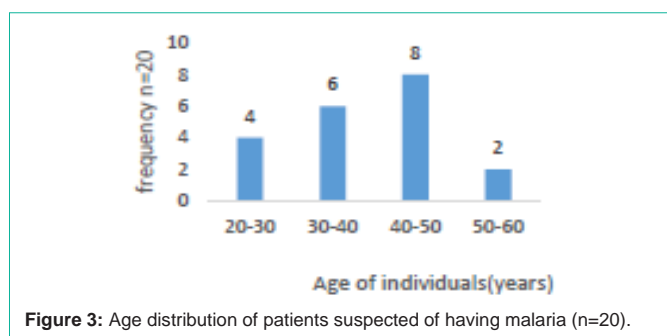
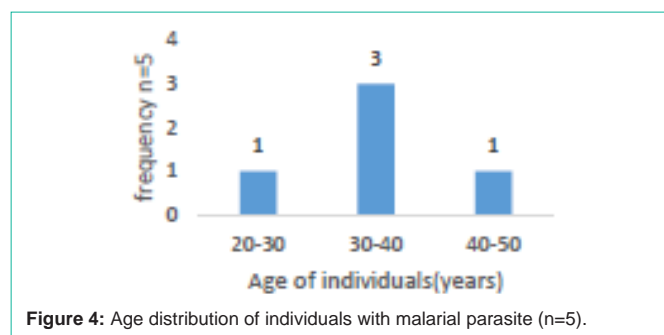
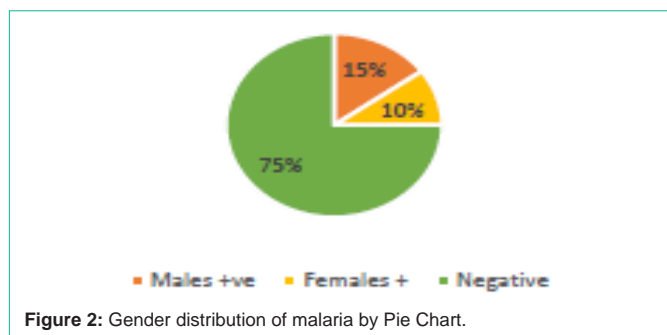
Gender distribution by Pie Chart: Gender distribution was estimated with the help of pie chart, which showed the ratio of males and females suffering from malaria. Mostly, males were suffering from malaria and their ratio is greater than females (Figure 2). From the 20 individuals selected, about 10% of the patients suffering from malaria were females, 15% were males and the remaining 75% were malaria negative [10].

Age distribution by bar graph: The distribution of age is determined or estimated with the help of a bar graph. Different individuals of varying ages were present in the data of malarial patients. Most commonly, malaria infections were present in males however, females were less affected.

The graph in figure 3 showed the ages of individuals from whom the blood samples were collected. Most individuals lies in the age 40 to 50 years [11]. They all were not malaria positive. Only 5 of them



Figure 1: Positive results of patients suffered from *P. vivax*.



gave positive results and they belong to different ages.

The graph in figure 4 shows the age of individuals who gave positive results of malaria infection. These individuals were suffering from *Plasmodium vivax*. They were of varying ages like individuals having age between 20-30 years and 40-50 years, only 1 one of the individual was suffered from *Plasmodium vivax*. Maximum individuals suffering from *Plasmodium vivax* lie in the age 30-40 years.

Incidence rate of malaria: The incidence rate of malaria can be calculated by dividing the positive malarial patients by total number of patients and then multiply by 100.

$$\text{Incidence rate} = \frac{\text{Positive malarial patients}}{\text{Total number of patients}} \times 100$$

$$\text{Incidence rate} = \frac{5}{20} \times 100$$

$$\text{Incidence rate} = 25\%$$

The incidence rate of *Plasmodium vivax* is 25% because 5 out of 20 individuals gave positive results while other 15 individuals were malaria negative.

About 60% of the people of Iran suffered from malaria before using any preventive measures. Malaria was the major reason of about 30%-40% deaths in Iran. In 1945, the first campaign was started in Iran against malaria. In 1947, DDT was used for the first time near Tehran against malaria [12]. It decreases the transmission of malaria. In 1980, Malaria Eradication Program (MEP) was started as a preventive measure campaign against malaria, but malaria spreads in the northern areas of the country. *P. vivax* and *P. falciparum* are commonly found in Iran; however, *P. malariae* is rarely present. In 1995, the infections of *P. falciparum* in Iran were about 45% but they decreased with the passage of time to about 12% in 2005 [7]. Mostly, infections of malaria in China are caused by *P. vivax* and *P. falciparum*. In 1998, *P. falciparum* was rare in China and it is present

in only two provinces of China, Yunnan and Hainan. The infections of malaria by *P. vivax* were about 95% in 2012. China sets a new goal that they will completely eradicate malaria from the country in 2020 [8]. The incidence rate of malaria in India is about 61% and about 41% of deaths are caused by this disease. About 53% of malaria is caused by *P. vivax* but it decreases to about 34% in 2014. About 80% of the malaria cases were found from 10 states of India, which have high transmission of malaria. *P. falciparum* and *P. vivax* is responsible for most of the malarial infections [9]. Malaria infections are widely present in Afghanistan [13]. The incidence of infections of *P. falciparum* is greater as compared to *P. vivax*. *P. falciparum* is responsible for about 95% of the infections while the remaining 5% are caused by *P. vivax*. A report from 5 provinces of Afghanistan was obtained in 2016 in which infections of *P. falciparum* were about 84%, while *P. vivax* were about 85% [1].

Conclusion

It has been concluded from the above study that the incidence rate of *Plasmodium vivax* is greater as compared to *Plasmodium falciparum* in Kasur as these two species of Plasmodium are present in Pakistan. Most of the individuals were suffered from *Plasmodium vivax*, which showed its presence in Kasur.

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Authors Contribution

The research study was designed and supervised by Dr. NH, Assistant Professor at the department of Microbiology and Molecular Genetics, University of the Punjab, Lahore. Sample collection and other experimental work was done by SFS under the supervision of Dr. NH.

References

1. WHO, Regional Office for the Eastern Mediterranean. Malaria in Afghanistan. 2018.
2. Cloonan N, Fischer K, Cheng Q, Saul A. Aldolase genes of Plasmodium species. Mol Biochem Parasitol. 2001; 113: 327-330.
3. Beg MA, Sani N, Mehraj V, Jafri W, Khan MA, A Malik, et al. Comparative

- features and outcomes of malaria at a tertiary care hospital in Karachi, Pakistan. *Int. J. Infect. Dis.* 2008; 12: 37-42.
4. Raza A, Ghanchi NK, Khan MS, Beg MA. Prevalence of drug resistance associated mutations in *Plasmodium vivax* against sulphadoxine-pyrimethamine in southern Pakistan. *Malar. J.* 2013; 12: 261.
 5. Cooke AH, Chiodini PL, Doherty T, Moody AH, Ries J, Pinder M. Comparison of a parasite lactate dehydrogenase-based immunochromatographic antigen detection assay (OptiMAL) with microscopy for the detection of malaria parasites in human blood samples. *Am J Trop Med. Hyp.* 1999; 60: 173-172.
 6. Lai S, Li Z, Wardrop NA, Sun J, Head MG, Huang Z, et al. Malaria in China, 2011-2015: an observational study. *Bulletin of the World Health Organization.* 2017; 95: 564.
 7. Raeisi A, Gouya MM, Nadim A, Ranjbar M, Hasanzehi A, Fallahnezhad M, et al. Determination of malaria epidemiological status in Iran's malarious areas as baseline information for implementation of malaria elimination program in Iran. *Iranian journal of public health.* 2013; 42: 326-333.
 8. Guthmann JP, Ruiz A, Priotto G, Kiguli J, Bonte L, Legros D. Validity, reliability and ease of use in the field of five rapid tests for the diagnosis of *Plasmodium falciparum* malaria in Uganda. *Trans R Soc Trop Med Hyg.* 2002; 96: 254-257.
 9. Anvikar AR, Shah N, Dhariwal AC, Sonal GS, Pradhan MM, Ghosh SK, et al. Epidemiology of *Plasmodium vivax* malaria in India. *The American journal of tropical medicine and hygiene.* 2016; 95: 108-120.
 10. Kar I, Eapen A, Adak T, Sharma VP. Trial with ParaSight-F in the detection of *Plasmodium falciparum* infection in Chennai (Tamil Nadu), India. *Indian J Malariol.* 1998; 35:160-162.
 11. Rubin E, Farber JL. Chapter 9. Infectious and Parasitic Diseases. Pathology. J.B. Lippincott, Philadelphia. Malaria. 1994; 421-424.
 12. Mills CD, Burgess DC, Taylor HJ, Kain KC. Evaluation of a rapid and inexpensive dipstick assay for the diagnosis of *Plasmodium falciparum* malaria. *Bull World Health Organ.* 1999; 77: 553-559.
 13. WHO. Mosquitoes of the genus Anopheles in countries of the WHO European Region having faced a recent resurgence of malaria. Regional research project, 2003-2007. World Health Organization. 2008.