

INCIDENCE OF MALARIA IN THE URBAN AND PERI URBAN AREAS OF DISTRICT CHARSADDA PAKISTAN

INSHAAL ALI¹, SHAHZAD MUNIR², SIKANDAR KHAN SHERWANI³, FAYYAZ UR REHMAN¹, QAISER JAMAL², ASADULLAH², MUHAMMAD NASEER ABBAS², ABDULLAH KHAN² AND MUHAMMAD ANEES²

¹Department of Microbiology, Abasyn University Peshawar, Khyber Pakhtunkhwa, Pakistan

²Department of Microbiology, Kohat University of Science and Technology Khyber Pakhtunkhwa, Pakistan

³Department of Microbiology, Federal Urdu University of Arts, Science and Technology Karachi Pakistan

Abstract

Malaria is one of the most devastating diseases in the world. This study was conducted to investigate the incidence of malaria in the urban and peri urban areas of district Charsadda. A total 1896 malaria patients were examined from August to September 2012. Out of 1896 samples, 1084 were collected from laboratories and 812 from the hospitals. Among the total, 653 were male and 590 were female patients. 1616 and 280 patients were infected with *Plasmodium vivax* and *Plasmodium falciparum*, respectively. The highest rate of infection (39.13%) was found in the patients with the age 31 years and above. However the infection was less common in the age group of 1 – 10 years (15.08%). Similarly the infection was more common in illiterate people (54.11%). Seasonal variation was also observed with 550 cases recorded in August and 1346 in September and among them 1400 from peri-urban and 496 from urban areas. It was found that infection with *P. vivax* was more common. Therefore, it can be concluded that the incidence of malaria is comparatively high in the peri-urban areas than in urban areas.

Introduction

Malaria is one of the most prevalent tropical disease worldwide (Khan *et al.*, 2005). It is one of the most destructive diseases in the world. About 300 million people are affected by malaria and causes more than a million deaths per year worldwide and it kills more than a million children each year under 5 years of age and pregnant women (Korenromp, 2004) (Bhalli & Samiullah, 2001).

Malaria is transmitted by the bite of infected Anopheles mosquito and is caused by protozoan parasite of the genus Plasmodium. Malaria can be transmitted by blood transfusion, needles stick, accident and from mother to fetus (Georing *et al.*, 2008). In human malaria is caused by *P. falciparum*, *P. ovale*, *P. vivax* and *P. knowlesi* (Sing *et al.*, 2004). In Pakistan *falciparum* and *vivax* malaria are the major ones in prevalence. It is found that *falciparum* malaria increase six folds almost to 42% of all malaria cases as once recorded by National Malaria control program (Shah *et al.*, 1997).

The symptoms of the disease are severe chills, high fever, sweating, headache, myalgia and vomiting. In some cases this infection by *falciparum* malaria may progress to coma, convulsion and death (Green Wood *et al.*, 2006). The primary vector species in Pakistan are *A. culicifacies* and *A. stephensi* (Malaria control program, 2000). The microscopic examination of Giemsa stained thick and thin blood smears are the standard method for detecting Plasmodium infection and very effective and inexpensive (Payne, 1988).

In malarial endemic areas, different factors such as poverty, poor socioeconomic status, low literacy rate and poor environmental condition are responsible for mosquito friendly environmental condition (Coker *et al.*, 2001).

The drugs used for malaria include mefloquine, atovaquone-proguanil, sulfadoxine-pyrimethamine, quinine, clindamycin, doxycycline, chloroquine, and primaquine (Tinto *et al.*, 2006). Malarial parasite developed resistance against a wide range of drugs (Kain 1995). Chloroquine resistance was developed in Southeast Asia and South America in the end of 1950s and in Africa by late 1970s (Warhurst, 2001). Many patients in Pakistan are also suffering from chloroquine resistance malaria (Khan *et al.*, 2004).

In 2004, 103,416 cases of malaria were reported in Pakistan. In 2006 No. of cases were 124910, similarly in 2007 128570 and in 2008 104454 cases were reported. In Pakistan the estimated number of annual malaria episode is 1.5 million (WHO, 2009).

Major Objective of the study

1. To determine the current status of malaria in the local population of District Charsadda.
2. To find out the ratio of malarial species inflicting the disease.
3. To evaluate the risk factors involved in the incidence of disease.

Minor Objective of the study

1. To assess the gender-wise and age-wise distribution of malaria in the understudy population.
2. To highlight the pattern for its effective prevention and control.

Materials and methods

Study Area: The study was conducted from August, 2011 to September, 2012 in the urban and peri-urban areas of District Charsadda. Charsadda is located in the west of the Khyber Pakhtunkhwa and is bounded by Malakand District on the north, Mardan district on the east, Nowshera and Peshawar districts on the south and the Mohmand Agency of the Federally Administered Tribal Areas on the west. The District lies between 34-03' and 34-38' north latitudes and 71-28' and 71-53' east longitudes. The district covers an area of 996 square kilometers. Charsadda features a semi-arid climate, with very hot summers and cooled winters. Winter in Charsadda starts in mid-November and ends in late-March, while summer months are May to September. The mean maximum summer temperature surpasses 40 °C (104 °F) during the hottest month, and the mean minimum temperature is 25 °C (77 °F). The mean minimum temperature during winter is 4 °C (39 °F), while the maximum is 18.35 °C (65.03 °F).

Cases of human malaria are very frequent in the District Charsadda throughout the year but the infection rate remained higher from July to November.

Sampling: In this study the malaria was detected by method of passive case detection (PCD) and Active Case Detection (ACT) techniques. The blood samples were taken from the patient with history of malaria in accordance to their responses on the pretested standardized questionnaire, who presented themselves to the hospitals and private diagnostic labs.

Requirements: The blood samples collected from the person were then analyzed for detection/identification of malarial parasites through microscopy of Giemsa stained thick and thin blood smears.

Procedure: A drop of blood was taken from the finger of patient by using sterilized prickers separately in each case. Complete data about each patient was collected and the information about age, sex, locality, area, housing, education and other risk factors were recorded for further analysis.

Microscopy: The thick and thin smears were prepared and were Giemsa stained, later subjected to detection and identification of malarial parasite under microscope by using 100X immersion lens.

Giemsa staining of thick blood films:**Procedure:**

- We took 3 to 5 drops of peripheral blood on clean glass slides.
- Then smear was made with the help of other slide.
- The length of film on slide should be one-third of an inch.
- It was left to the air dry properly for a few minutes.
- The slide was placed on staining rack and Giemsa stain was poured on it.
- The slide was left to stain for 10 to 15 minutes.
- It was rinsed very carefully and gently.
- Finally the slide was then observed with 100X oil immersion lens for the detection of malarial parasite.

Giemsa staining of thin blood films:**Procedure:**

- We took a drop of peripheral blood on slide and made smear by using other slide.
- The length of thin smear must be 1 inch.
- The thin smear was then air dried and then was fixed in methanol for 30 seconds.
- Giesma stain was poured on the slide.
- It was left to stain for 10 to 15 minutes.
- The slide was then rinsed carefully under running tap water and was left in an upright position to air dry.
- Lastly the slide was observed under 100X oil immersion lens for the detailed of morphological identification of the malarial parasite.

Analysis of Data: The data was obtained from questionnaire and analyzed to determine the association of disease with age, gender and education.

Results and Discussion

The present study was conducted to determine the incidence of malaria in the urban and peri-urban areas of District Charsadda. A total 1896 patient were examined from August, 2011 to September 2012. In this study the patient were examined on the basis of age, sex, locality, housing, education and other risk factors.

Location-wise incidence of Malaria: Out of 1896 samples 1084 were collected from the laboratories and 812 from the hospitals as shown in the table and figure 1. Most of the people used to go to private labs in the Charsadda due to lack of facilities in the government hospitals and due to save the time as well. A study conducted by Reubush *et al.* (1995) showed that most of patients preferred public hospitals since it was claimed to be cheaper.

Age-wise incidence of Malaria: In our study it was found that the rate of infection is highest (39.13%) in the patients with age group 31 and above, followed by age group of 21-30 years (23%), and 11-20 years (22.8%) as shown in the table 2. the infection was less common in the age group of 1-10 years (15.08%).

Education-wise incidence of Malaria: It is observed that malaria is more common in the illiterate people (54.11) and the people with primary level of education (36.18%). The infection was very low in the patients with metric (6.96%) and intermediate level (2.21%) of education. However infection is least common in the graduates (0.53%) and also among highly educated people as shown in the table and figure 3. the reason is that illiterate people are not fully aware of how they can prevent themselves from, such infection and once they developed such infection they did not know how to require the treatment properly. As one of the confounding factors, the level of education, that has found as one of the important factor in the malarial infection. In finding by Anand and Ramachandran (2010) also documented the result which were similar to our study.

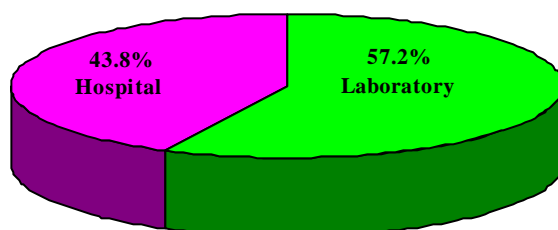


Fig. 1 Location-wise incidence of Malaria in District Charsadda.

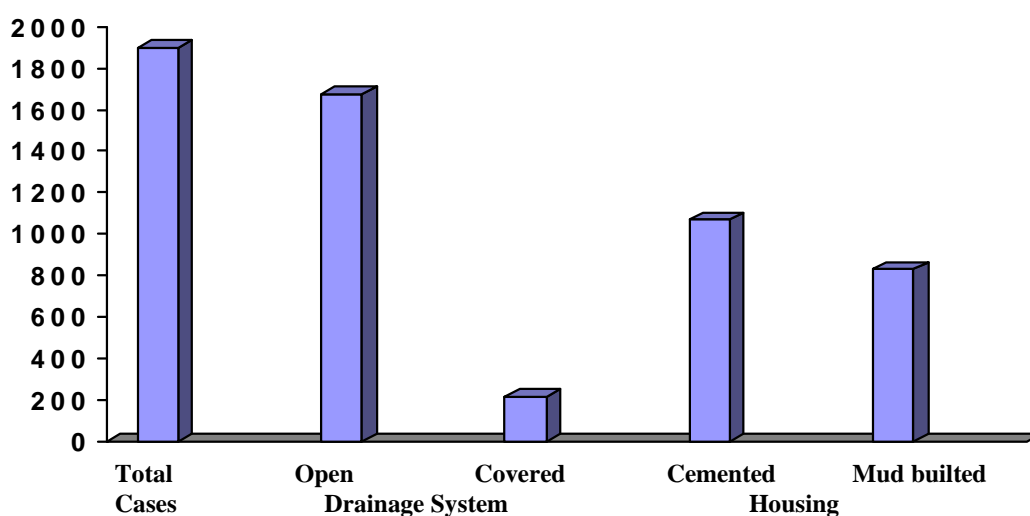


Fig. 2 Incidence of Malaria on the basis of Housing and Drainage System.

Table 1 Location-wise incidence of Malaria in District Charsadda.

S.No	Location	Cases	Percentage %
1	Hospital	812	42.8
2	Laboratory	1084	57.8
	Total	1896	100

Table 2. Age-wise incidence of Malaria in District Charsadda.

S.No	Age (years)	Cases	Percentage %
1	1 to 10	286	15.1
2	11 to 20	432	22.8
3	21 to 30	436	22.9
4	31 and above	742	39.1
	Total	1896	100

Table 3. Education-wise incidence of Malaria in District Charsadda.

S.No	Education	Cases	Percentage
1.	Illiterate	1026	54.1
2.	Primary	686	36.2
3.	Matriculation	132	6.9
4.	Intermediate	42	2.2
5.	graduate	10	0.5
	Total	1896	100

Table 4. Incidence of Malaria on the basis of Month, Gender and species in District Charsadda.

S.No	Species	No. of causes in August (550)		No. of causes in September (1346)	
		Male	Female	Male	Female
1	<i>Vivax</i>	304	188	802	146
2	<i>Falciparum</i>	38	20	162	60
	Total	342	208	964	382

Gender, Month and Species-wise incidence of Malaria: Among 1896 patients, 550 cases were recorded in the month of August and 673 cases were recorded in the month of September. 304 and 802 cases of vivax were observed in males in August and September respectively. And 19 and 81 cases of *P. falciparum* were recorded in males in August and September respectively as shown in the table 4. The high rate of infection observed in the males in our study might be due to male predominance in our society, making easier for males to visit hospitals and to treat malarial infection. Another reason may be that because of the more exposure of male to the bite of mosquito infected with malarial parasite. In female, 188 and 146 patients were infected with *plasmodium vivax* for the month of August and September respectively as shown in table 4. While 20 and 60 females patients were suffering from infection with falciparum in August and September respectively. Seasonal variation was observed. Jalal ud-din *et al.*, (2006), Yasinzai *et al.* (2008), Tasawar *et al.* (2003) and Yar *et al.* (1998) also observed the same results.

Incidence of Malaria on the Basis of Housing and drainage System: In the observed population, majority of cases (1400) were reported from peri-urban areas and 496 from urban areas. This is because of lack of awareness and also due to lack of facilities. Anand and Rmachandran (2010) had also observed the same results. The Fig. 5 shows that 1066 patients are living in the cement houses and 830 are living in mud built houses. Only 220 patients' houses had closed drainage system in their houses and 1676 were with open drainage system. This is because open drainage system is favorable for the breeding of mosquitoes. A study by Anand and Ramchandran (2010) reported the similar observation.

Conclusion

Malaria is a major public health problem in the world. According to data collected, risk of malarial parasite in District Charsadda is high. *Plasmodium falciparum* and *Plasmodium vivax* are very common in Charsadda. No case of *Plasmodium ovale* and *Plasmodium malariae* was observed in our samples. Health agencies should offer education about practices to prevent future malarial infections.

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