



ISSN: 2348-5906
CODEN: IJMRK2
IJMR 2020; 7(3): 55-58
www.dipterajournal.com
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Received: 28-03-2020
Accepted: 30-04-2020

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Epidemiological study on malarial infection in district Pishin Balochistan, Pakistan

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Abstract

Malaria is one of the serious health issues throughout the world, caused by vector borne diseases of the genus Plasmodium. The word malaria comes from the Italian words 'mala' and 'aria' means bad air. Five species of *Plasmodium* parasites, *P. vivax*, *P. falciparum*, *P. ovale*, *P. malariae* and fifth specie *P. knowlesi* have been reported in some countries. Malarial parasite completes their life cycle in two hosts, one is female anopheles' mosquitos (insect vector) and 2nd is human beings. Malaria is reported from June to September and becomes more common in rural areas as compared to urban areas in Pakistan. A total no of about 3031 malarial blood slides were carefully arranged from both genders' male and female population from 13 diverse villages, their BHUS laboratories and the main populated Pishin city. In month wise incidence of concern disease, *Plasmodium vivax* appeared with a peak in July (41.6%) and was not present in the month of January (0%). Gender wise malarial status revealed to be higher in Males (60.4%) and lowest in Females (46.5%).

Keywords: Epidemiology, *Plasmodium* parasites, *P. vivax*, *P. falciparum*

Introduction

Balochistan is one of the fourth province of Pakistan, positioned in south-west of the country. Balochistan covers up an area of about 347, 190² km 134, 050² mi, moreover it is the largest province of the country which constitute 44% land in Pakistan. Pishin is a largely populated district of Balochistan Province of Pakistan, located 42 km away towards north from Provincial capital Quetta and its District status got established in 1975. It is situated 1370-1680 meters above sea level. This district has boundaries connected with Afghanistan which is also connected through kadani, in route for the west, district Killa Saifullah in the direction of the east, district Killa Abdullah headed for the west, the two districts, one Quetta and second Ziarat are connected to the south of Pishin. The climate of Pishin is referred to as a local steppe climate and extreme temperature variations have been observed at Pishin, the temperature falls to 4 to 6 at winter and raise up to 30 to 36 degrees centigrade at summer. Pishin is geographically mountainous and planed, semi-Arid little warm in season of summer and enough freezing in season of winter. In Pishin district, population is extremely deprived of hygienic toilets, majority of the population do not have proper toilet system hence they got easily in contact with common human diseases like malaria, hepatitis, cholera, measles and typhoid [1].

Malarial infection is one of the most serious health threatening issue from very ancient time caused by a eukaryote protozoan, plasmodium parasite. The vectors which transmit the plasmodium is generally a female Mosquito called Anopheles in human and culex in birds. The word malaria has been taken from Italian phrases that indicate "mala" named for bad and "aria" denoted for polluted air [2].

Detection of malarial infection greatly depends on the quality of the diagnostic instruments and equipment. Various available diagnostic methods include light microscopy of blood, RDTs and molecular strategies such as PCR polymerase chain reaction and loop-mediated isothermal amplification [3].

Due to less education and poor socioeconomic status, malaria is very common in rural areas. The frequency of *P. falciparum* among the Afghan refugees is elevated compared to Pakistan's local population. A few epidemiological studies have shown that there has been an increase of

24 to 36% malaria cases in Pakistan due to Afghan refugee immigration to Pakistan^[4].

Malaria infectivity is still a considerable health threat in both the urban and rural areas of Pakistan due to shortage of facilities, deprived cleanliness, lack of education and poor literacy level. The problem of malaria arose in Pakistan as well as in the provinces of Balochistan, KPK, Sindh and the Federally Administered Tribal Areas, which have recently been merged in KPK and also in refugee camps. Transmission of malaria is observed to be significantly high, with the major transmission of *P. vivax* that is high in hot weather from June to September and again in April to June and with infection recurrences in December^[5].

Malaria is included in serious life threatening and injurious diseases from very past and still it is a dominant issue not only in Pakistan but also for the rest of the countries. Malaria disease is specially a burden for developing and less developed countries. Malaria is considered as one of the major reasons for deaths in the world population and still malaria is the main cause of morbidity and mortality in poorly developed regions in the world^[6].

In Pakistan, there are different factors that contributes and encourage appropriate environment for malarial spread which includes agricultural practices with an immense irrigation system and monsoon rains, additionally travelling of population inside the country as well as across international borders which are with Iran and Afghanistan respectively^[7]. Present research was conducted to determine malarial status in pishin distict for its effective management and control.

Materials and Methods

The entire study was conducted in Pishin (Rural and Urban) district. Blood samples were obtained using pricking method followed by slide preparation to detect malaria with the use of a light compound microscope (Fig 1-2).

Data collection

Two PCD and ACD methods are widely used to detect cases of malaria. PCD (passive case detection) was successful in analyzing the blood of the patient which showed signs and symptoms of malaria disease.

For ACD (active case detection), home visits were conducted to examine the blood of the individuals with signs and symptoms of malaria or a history of current or near-past indication of malaria.

Blood slides were then prepared, thick, thin films both, and

stained slides were further tested for parasite detection in the laboratory^[8].

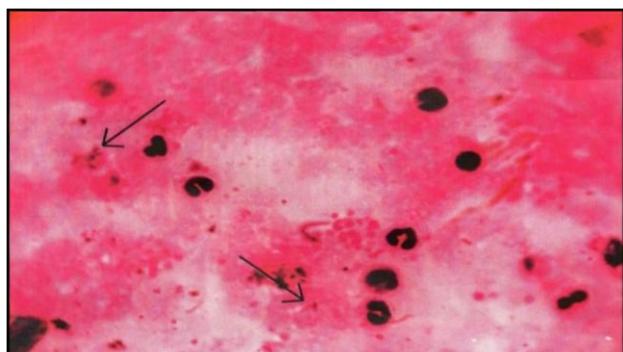


Fig 1: Gametocytes of *P. vivax*

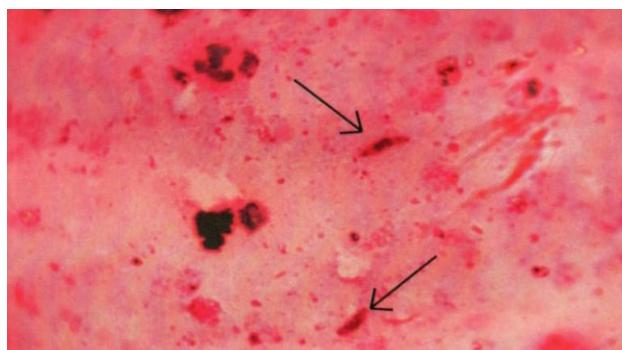


Fig 2: Gametocytes of *P. falciparum*

Results

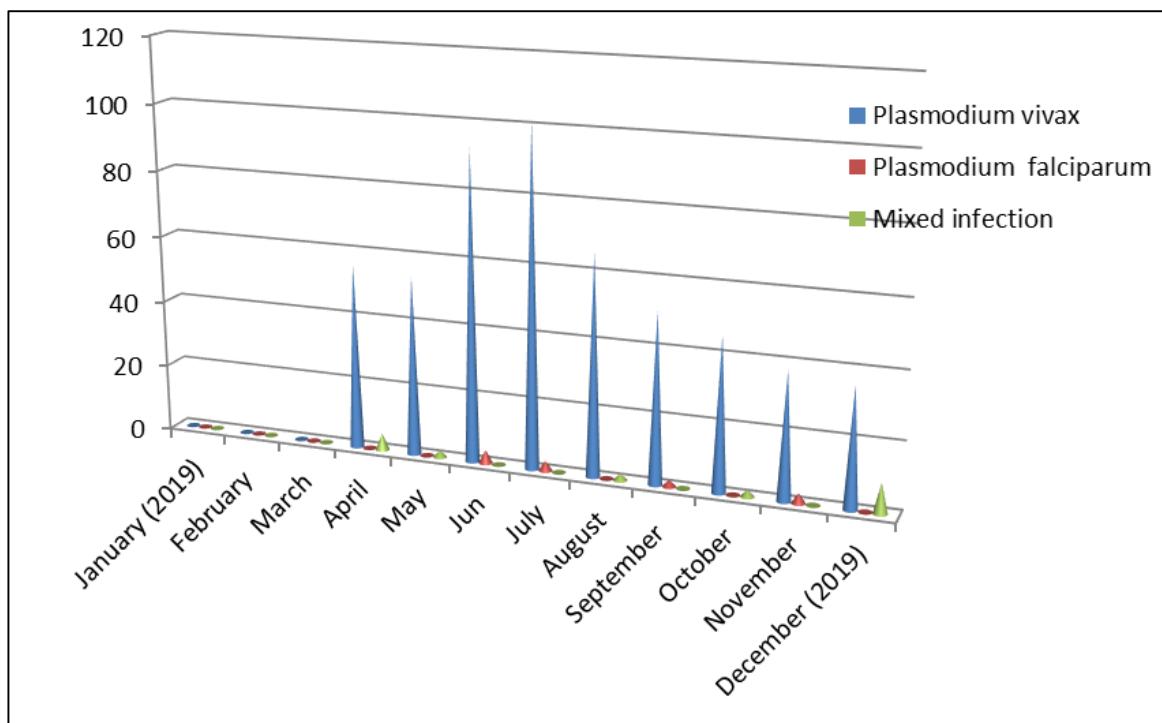
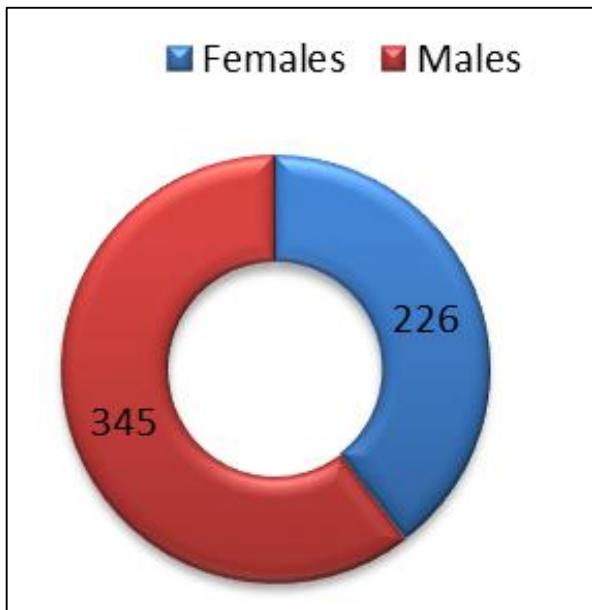
A total no of about 3031 malarial blood slides were carefully arranged from both genders' male and female population of 13 diverse villages, their BHUS laboratories and the main inhabited area of district Pishin. Month-based incidence of concern disease resulted in high ratio of *P. vivax* in July (41.6%), June (33.4%), August (24.6%) and lowest (0%) in the month of January, February, and March, moreover mixed infection was observed in April, May, August, October and December (Table.1). The Gender-wise malarial status was higher in Males (60.4%) and lowest in Females (46.5%) (Table 2). The same frequencies and percentages are also expressed in graphs, month wise is expressed in figure 3 and gender wise is shown in figure 4 of malarial infection.

Table 1: Month wise occurrence of malarial infectivity of Pishin district

S. No	Month	Examined slides	Positive slides	<i>P. Vivax</i>	<i>P. Falciparum</i>	mixed infection
1	January (2019)	241	0	0	0	0
2	February	237	0	0	0	0
3	March	242	0	0	0	0
4	April	245	58	56	0	02
5	May	246	56	54	0	02
6	Jun	278	97	93	04	0
7	July	252	105	102	03	0
8	August	276	68	66	0	02
9	September	261	53	51	02	0
10	October	273	48	46	0	02
11	November	246	41	38	03	0
12	December (2019)	234	45	36	0	09
	Total	3031	571	542	12	17

Table 2: Gender-wise status of Malaria

S. No	Total slides studied	Total (+ve) slides studied	Total male (+ ve) slides studied	Total female (+ ve) Slides studied
1	3031	571	345 (60.4%)	226 (46.5%)

**Fig 3:** Month wise status of malaria in Pishin**Fig 4:** Gender wise status of malaria in Pishin District

Discussion

The current research study expresses that the total No. of 3031 slides were prepared and these concerned people were under trial to detect the parasite frequency in 13 various areas of the district Pishin including main city. Total 571 slides turned out to be positive (18.8%), out of 3031 suspected slides, in which the *P. vivax* incidence was considerably high with 542 positive slides (94.9%) as compare to *P. falciparum* with 12 positive slides (2.1%) in entire area and the occurrence of mixed infection was about 17 positive slides (2.9%).

The earlier research study work regarding malarial prevalence noted elevated frequency of *P. vivax* in Balochistan province in district Khuzdar (67%). Gender wise prevalence of malaria was highest in males (60.47%) than females (39.52%), as gender variation in malaria transmission exists as a result of Pakistan's socio-economic structure, such as low female involvement in agriculture activities. Consistent high prevalence of malaria in autumn may be due to monsoon as it facilitates favorable temperature in these months and also these monsoon rains contributes in formation of pools of stagnant water which provides suitable circumstances for the breeding of mosquitoes and therefore results in elevated malaria instances [2, 9].

Another recent work carried out by Sumbal *et al.*, in Quetta (city) district of Balochistan reported positive cases as 19.56% whereas *P. vivax* was higher (84.52%) than *P. falciparum* (6.01%) and mixed infection (12.29%). Male are more likely to be outside the home at night, compared to females so it facilitates more cases of males than females. [5]. According to another study report [10], it was noted that malaria disease incidence was very high in the month of August (15.18%) and low in the month of June (9.5%). Malaria infection was extensively high in gender males with a percentage (65.20%) as compared to gender females (34.70%) in gender-based occurrence.

Conclusion

Malaria is highly prevalent in Balochistan, and malarial control has become challenging largely due to misdiagnosis, shortage of laboratory facilities, lack of proper medications and lack of awareness. In this study, malarial prevalence turned out to be very high in month of July with high

incidence in males as compared to females and *plasmodium vivax* in current study appeared to be the most prominent species. This study emphasizes on the need that malarial control efforts should be more focused on Balochistan.

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