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Malarial Prevalence in Balochistan Province, Pakistan (2002 -2020)

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Abstract

A vector borne disease of a specific genus, plasmodium causes malaria, being regarded as one of the significant medical problem. Malarial parasite that is transmissible generally by the female mosquito, Anopheles known as malarial vector. This research study was designed to acquire baseline data regarding malarial prevalence in Balochistan and also to identify different risk factors responsible for its prevalence. *Plasmodium vivax* and *Plasmodium falciparum* were found to be the most prominent species in Balochistan. High malarial incidence in Balochistan was observed to shift from one district to another in different years and still appeared to be a major issue that need to be monitored.

Keywords: Prevalence, *P. vivax*, *P. falciparum*, malaria

Background

Malarial infection is one of the major medical issue caused by the plasmodium parasite and is transmitted by Anopheles vector. The word malaria in Italian phrases "mala" named for bad and "aria" denoted for worst air. Globally four species of *plasmodium* are prevalent, *P. falciparum*, *P. vivax*, *P. malariae*, *P. ovale* and the fifth specie *P. knowlesi* now has been discovered in some countries, with *Plasmodium falciparum* and *Plasmodium vivax* as the most predominant [1]. The 2018 World Malaria Report revealed that 219 million cases were reported and 435,000 confirmed deaths. Most of these deaths occurred in the area of Africa (92%) relative to South-East Asia (5%) [2].

Pakistan is a tropical agricultural country where the majority of the population lives in rural areas with a default framework for water system and inappropriate dumping of waste to increase malarial outspread. Pakistan is one of the regions where malarial disease remains to be an exceptional major medical issue associated with large agricultural activities [3]. Malaria fever is normally diagnosed with a minute analysis with the use of blood films or with fully fast diagnostic testing, based on antigens [4]. Malaria remains a major health problem in Pakistan cities and rural areas owing to lack of facilities and awareness. Pakistan's major transmission time period for malaria infection is through August. Malaria is present mainly in the Balochistan Districts, Sindh, KPK and FATA. Malarial transmission is considered critical in Balochistan, with significant transmission of *P. vivax* starting from June up to September and then again from April to June, additionally infection reappearances in December [1, 8].

P. falciparum and *P. vivax* malaria are significantly prevalent in Pakistan with cerebral malaria as a major public health problem in Balochistan. Shah *et al.*, reported an increase in *P. falciparum* malaria fever, which consisted of 42% of all malarial cases recorded by country wide Malaria control program [5, 6]. Ziarat (Balochistan district) itself is a coldest and snow-falling region and in these traces there is no malarial disease, but its community used to go to work in the area of the most endemic regions of malaria, Harnai, Shahrag and Sibi and settles there up to the beginning of maximum hot season and afterwards move to Ziarat in summer season. Finally, the population gets malarial disease for being residing within the hottest zones and conveys it to Ziarat after they return [7]. In addition, huge flood and the connection of displaced people from Afghanistan, in which *P. falciparum* is constantly usual, can transfer this *P. falciparum* to population of Balochistan [9-11].

Searching Method for Literature

Electronic search engine was utilized for literature collection and the keywords employed for

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literature search were mainly malarial prevalence in Balochistan, risk factors, species distribution, etc. The specific

time frame selected for articles was from 2002 to 2020.

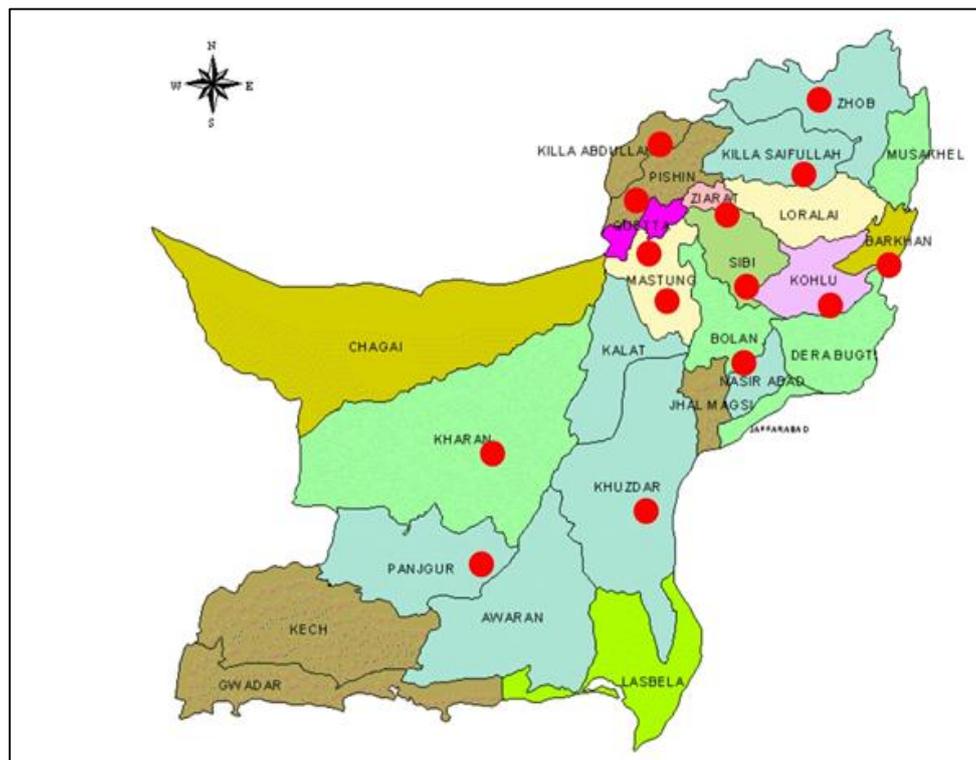


Fig 1: Map Showing Malarial Prevalent Districts of Balochistan

Data Review of Malarial Prevalence in Different Districts Of Balochistan

Pakistan is a country endemic to *P. Vivax*, *P. Falciparum* and major species causing malaria. It is one of the leading health problems with special reference to Balochistan. For implementation of an effective malarial management program in Balochistan, an accurate and precise picture of a scenario is required. The present study will help to determine the incidence of malarial parasites in human population residing in different districts of Balochistan. Malarial prevalence studies in Balochistan were found for Quetta (City), Killa Saifullah, Ziarat, Zhob, Sanjavi, Kohlu, Mastung, Panjgur, Barkhan, Harnai, Duki, Sibi, Qilla Abdullah, Khuzdar, and Pishin Districts of Balochistan (fig1).

In 2002 at Combined Military Hospital Zhob, Balochistan, Khadim^[12] reported 11.77% cases of malaria disease. In 2003, Yasinzai and Kakarsulemankhel^[13], investigated malaria incidence in Quetta district rural area as 16.25% with high prevalence of *plasmodium falciparum* compared to other species. In 2004, 15.42% of malaria infection occurred in the district of Quetta and *Plasmodium falciparum* with 8.57% prevalence was more prevalent compared with *plasmodium vivax* (6.85)^[14].

In Quetta region in 2005, Sheikh *et al.*,^[15] revealed 34.85% cases of malaria disease. In 2007, another study was conducted by Yasinzai and Kakarsulemankhel^[16], in Qilla-Abdullah. They investigated 3209 cases and revealed positivity ratio of 11.4% with incidence of 62.2% for *P. vivax* and 37.7% for *P. falciparum*. Like-wise in 2007, Yasinzai and Kakarsulemankhel^[17], demonstrated an examination in Balochistan (Mastung and Khuzdar), where overall 26.64% cases were discovered positive for malarial disease. In Mastung, the positivity status was 24.58, with high incidence

of *P. vivax* (52.67%) than *P. falciparum* (47.32%) while in Khuzdar, 28.42% positivity ratio was found with high prevalence of *P. vivax* (69.89%) than *P. falciparum* (30.10%). In 2008, Yasinzai and Kakarsulemankhel^[18], in Barkhan and Kohlu, neighboring zones of east Balochistan, declared 32.78% cases with high prevalence rate of *P. falciparum* (52.87) than *P. vivax* (47.12). Additionally, in 2008 an examination was completed by Yasinzai and Kakarsulemankhel^[19], in Zhob region and analyzed high rate of infection i.e. 41.8%. In another study in 2008 Yasinzai and Kakarsulemankhel^[20], provided an increased rate, 43.44% of malarial sickness in District Kharan. The ratio of *plasmodium vivax* (88.69) was considerably high compared to *Plasmodium falciparum* (11.3). Malarial infection was 43.44% in 2008 in district Karan, when differentiated with 11.77% in 2002 in Zhob.

In 2008, another investigation was conducted in Balochistan including Harnai, Duki and Sibi areas^[21]. The information demonstrated that 34.2% individuals were infected with malarial disease. In 2009, Yasinzai and Kakarsulemankhel^[22], at Central Balochistan District Bolan observed a high ratio of infection i.e. 39.04. In 2009, the frequency of malarial sickness was 26.8% as observed in District Ziarat and Sanjavi^[23] (Yasinzai and Kakarsulemankhel, 2009 II) with *P. falciparum* (69.5%) as the dominating species compared with *P. vivax* (30.2%). In 2012 Tareen *et al.*,^[24] determined in Quetta, 18.45% cases of malarial sickness in general public. In 2013, Yasinzai and Kakarsulemankhel^[25], revealed 38.3% malaria fever frequency rate in Panjgur, Balochistan. In 2017, in Killa Saifullah region of Balochistan Umer and Yasinzai^[26], reported positive cases with 20% frequency.

As of early 2018 Quetta (city) prevalence, studied by Sumbal, *et al.*, the average incidence of positivity rate was

19.56%, whereas *P. vivax* was higher (84.52%) than *P. falciparum* (6.01%) and mixed infection (12.29%). Female are less vulnerable to infection than male due to less activity of female outside compared to male. Male are at a greater risk of malarial infection because of their exposure to vector [1]. In 2019, overall prevalence in District Khuzdar was 27.9% with *Plasmodium vivax* increasingly predominant (67%) than *P. falciparum* (15.8%) and mixed infection (17.0%). Gender wise prevalence of malaria was high in males (60.47%) than females (39.52%), as gender variation exists in malaria transmission 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, which provides suitable situations for the breeding of mosquitoes and therefore results in elevated malaria instances [27]. Our study indicates that the occurrence of malaria was elevated vastly after 2008 in district Khuzdar. This could be due to various contributing factors like flood, stagnant water and the best temperature for their larval growth.

According to Farooq *et al.*, [2], in Pishin district, Plasmodium slide positivity's status was 18.8%, with high ratio of *P. vivax* infection (90.7%) in comparison to *P. falciparum* (4.8%) and was also seen a mixed infection (5.4%). Age-wise high positivity rate (26.42%) was shown in 21-30 years age group and lowest in 1-10 age groups (16.29%) due less outdoor activities of this age group. *P. Vivax* was having higher ratio than *P. falciparum* & also mixed infection. To inhibit further prevalence of malarial parasite, all these areas and nearby need to be checked for larval and adult mosquitoes.

All the regions mentioned in this study, reported high prevalence of both *P. vivax* and *plasmodium falciparum*

infection compared to other species. The reason behind high predominance of malarial sickness rate in Balochistan population may be because of the people's movement in the places of high hazard during dawn and dusk which is sustaining time of mosquitoes. On the other hand, chloroquine resistance has been clearly mentioned in the areas, reporting high prevalence [28]. There are few other factors responsible for high rate of malarial infection comprising limited healthcare facilities, illiteracy, lack of awareness and also socioeconomic factors including poverty. Year-wise malarial prevalence in different districts of Balochistan has been demonstrated in table 1 and figure 2.

Table 1: Year-wise Occurrence of malarial infection

Districts	Year's 2002-2018	Percentage%
Zhob	2002	11.77%
Quetta District	2003	16.25%
Quetta District	2004	15.42%
Quetta District	2005	34.85%
Qillah Abdullah	2007 I	62.2%
Mastung	2007 II	24.58%
Khuzdar	2007 III	28.42%
Barkhan	2008 I	32.78%
Kohlu	2008 II	58.91%
Zhob	2008 III	41.8%
Harnai/ Sibi/ Duki	2008 IV	34.2%
Bolan	2009 I	39.04%
Ziarat/ Sanjavi	2009 II	26.8%
Quetta District	2012	18.45%
Punjgor	2013	38.3%
Killa Saifullah	2017	20%
Quetta City	2018	19.56%
Khuzdar	2019	27.9%
Pishin	2020	18.8%

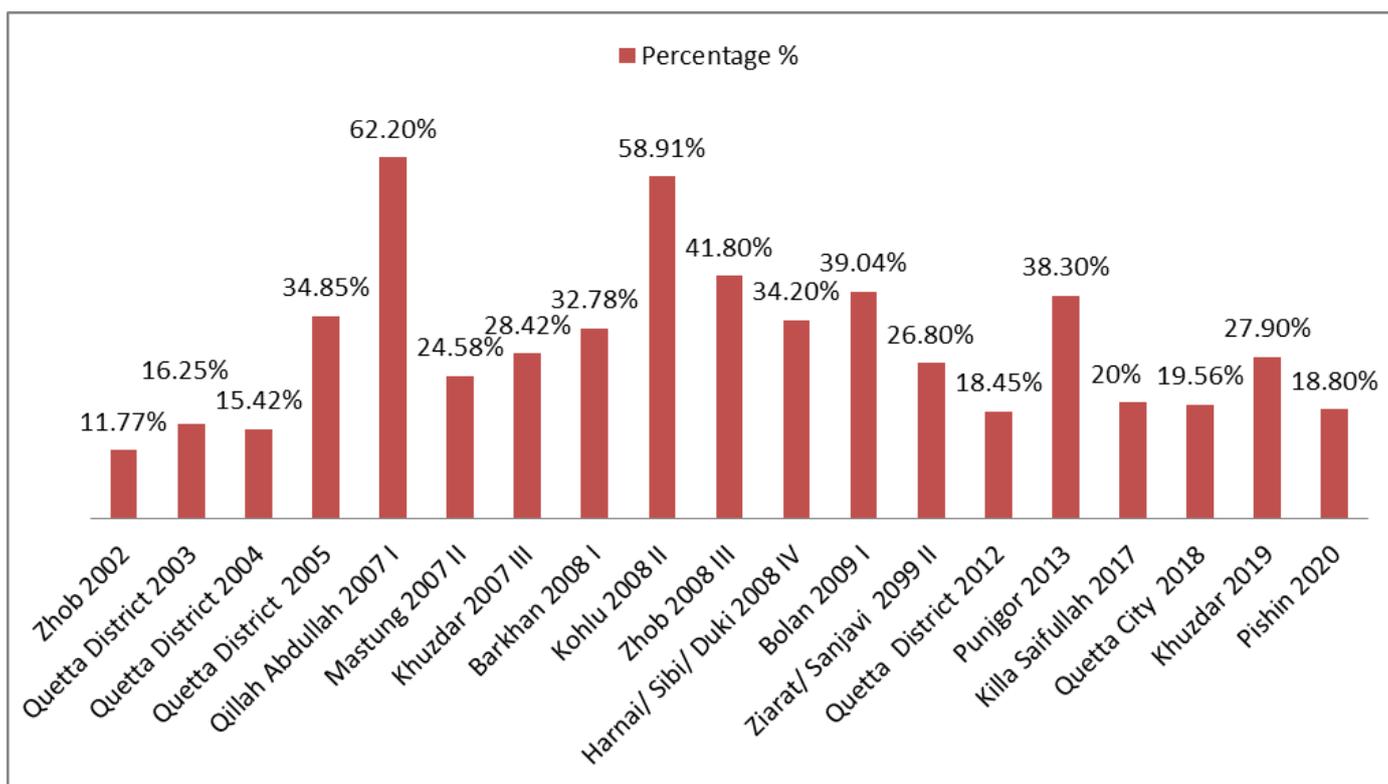


Fig 2: Malaria in Balochistan (2002- 2020)

Conclusion

The current study has turned into conclusion that in Balochistan malarial infection is quite prevalent and its high incidence has shifted exclusively from one district to another and hence poses to be a challenge for public health. Vector control, rapid and reliable diagnosing strategies for malarial species diagnoses, species-based malaria cure, proper preventive measurements, early treatment and anti-malarial campaigns would be effective in reducing the malarial cases in Balochistan.

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