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Month Wise frequency of Malaria during 2023-2024 in Hyderabad, Sindh, Pakistan

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Abstract: *The study highlights the occurrence of Plasmodium species in Hyderabad as malaria that is a major public health concern in Pakistan. The aim of this study is to conclude the trends of malaria cases in Hyderabad, Sindh. It will also notice the burden of Plasmodium species on monthly basis. In this research, the data were collected from January 2023 to December 2024 from Hyderabad Sindh. Data was analyzed by using SPSS-27. This study found that Plasmodium vivax cases showed clear dominance however Plasmodium falciparum and mixed cases also contributed to total malaria burden. The highest prevalence of cases was noticed in August to October. Not a single case of Plasmodium malariae and Plasmodium ovale were detected. In Hyderabad Sindh, the maximum number of the cases was carried out by Plasmodium vivax. The most important way to prevent malaria is by giving awareness through pamphlets or by conducting seminars. It can also be prevented by Spraying, wearing protective clothes, screening doors and windows.*

Key words: *Malaria, Plasmodium vivax, Prevalence, Hyderabad (Sindh)*

1. Introduction

For thousands of years, malaria has been known to affect humans. Pakistan has an incidence of one case per thousand people because it is in the endemic belt. Extreme poverty and a lack of knowledge about prevention measures are the main causes of Pakistan's reported 43% malaria prevalence. Plasmodium falciparum malaria is responsible for the highest fatality rate in Pakistan, where it is estimated that 50,000 deaths occur annually, primarily in infants, children, and pregnant women [1].

Plasmodium cause malaria, it is a disease that transmits to man by the bite of infected female Anophele mosquito. In 2017, there were 219 million cases of malaria worldwide, with the second-highest incidence occurring in South-East Asia. Over 50% of Pakistanis reside in the critical zone, which is the area where malaria is most common. In the Eastern Mediterranean region, Pakistan is ranked as the sixth most malarial transmission country. According to the 2019 Pakistan Malaria Annual Report, Plasmodium vivax was responsible for 84% of the malarial cases, with Plasmodium falciparum accounting for 15% and mixed infection for 1% [2].

Due to a lack of resources and knowledge, malaria continues to be a serious health issue in Pakistan's cities and rural areas. Post rainy season is when malaria infections in Pakistan are most likely to spread. The primary malarial regions include Balochistan, Sindh, KPK, and FATA. Malaria endemicity varies by region and even city, depending on climate. Anopheles culicifacies and Anopheles stephensi are the main vector species. Four of more than 100 known species Plasmodium vivax, Plasmodium falciparum, Plasmodium ovale, and Plasmodium malariae are especially important to human health. Notably, the majority of malaria cases are caused by Plasmodium vivax and Plasmodium falciparum. Worldwide, Plasmodium falciparum is widely recognized for its severity and high death rate.

2. Epidemiological study on Malaria Prevalence and Species distribution in the Human Population of District Hyderabad , Sindh, Pakistan

The WHO (2021) states that Plasmodium falciparum and Plasmodium vivax pose the greatest threats to public health. This study aims to clarify the relationships among socioeconomic circumstances, Plasmodium species distributions, and malaria prevalence. Plasmodium vivax has wider geographic range than Plasmodium falciparum, because it can survive at higher elevations and lower temperatures, however Plasmodium falciparum is associated with chronic and fatal clinical consequences. A recent change in species supremacy has been observed in Pakistan, where Plasmodium falciparum accounts for 23% of cases [3].

The burden of malaria remains a considerable number of patients and their deaths, which accounts for most sufferer visits and it has been the most important reason for hospitalization. Malaria spreads erratically and seasonally. September to December and April to May are the biannual transmission peaks, with the former having higher transmission rates. In rural places, the broadcast coincides with the main harvesting seasons. This proportion of malarial cases varies from place to place and from season to season. The pattern of malaria infection

especially in an area and locality on prevalence is less studied even though the disease burden has been known since the early past century. To the best of our knowledge, planning and implementing successful malaria control measures in the study area needs research of the trends of malaria infection. [4].

The province of Sindh (Pakistan) represents a critical region for malaria research due to its stubborn burden of malaria, ecological conditions and gaps in surveillance and malaria control program. The province experiences significant malaria transmission contributing to the high disease burden. Geographical and climatic factors, including the presence of riverine belts, coastal regions, and irrigation systems, create favorable conditions for vector breeding, while seasonal monsoons further exacerbate transmission [5].

The spread of malaria varies, with large outbreaks of P. vivax occurring June to September and again from April to June, as these infections reoccur in people in the following season. P. falciparum is most transmitted in Pakistan during the period from August to December. The main approach to controlling malaria is with anti-malarial drugs. Despite the effective programs against malaria, more than fifty thousand people still die each year. Using medicines against malaria, removing mosquitoes from wherever you are and avoiding mosquito bites are among the strategies to stop malaria. Pakistan has difficulties in lowering the incidence of malaria, despite the Government's efforts to manage the disease. Climatic change especially the erratic patterns of rain and temperature in recent years may be the somewhat the reason for these difficulties. The condition have been made worse by frequent and severe flooding events, which have definitely increased the mosquito breeding grounds and allowed the spread of malaria [6].

3. Methodology

The data used in this study was gathered from the Hyderabad district health office, also known as the DHO office. The DHO office in Hyderabad administers the Vector Borne Disease (VBD) control program. Vector-borne diseases, such as dengue, malaria, and others, are a serious public health risk that this office seeks to prevent and control. The DHO office oversees specialized programs like Malaria Control program and carries out disease control initiatives. The data which was obtained by District health office (DHO) was analyzed for the trends on the monthly basis, all malaria cases reported between January to December 2023-2024 cases reported between in this was carefully examined and surveyed for the prevalence of malaria. We conducted this research on two years data on Malaria prevalence, verbal approval was taken from the concerned office for data collection. Findings were summarized by using SPSS and the results were presented in tables and graph.

4. Results:

In 2023 overall 1,03,418 slides were examined out of which 17,435 cases were found positive for malaria. Moreover 17,155 cases had plasmodium vivax 2,183 cases had Plasmodium falciparum while 137 cases had mix infection. The monthly distribution of malaria cases in

2023 discloses Plasmodium vivax was the most prevalent species throughout the year, with the highest number of cases recorded in August 3,507 cases followed closely by September 3,141 cases and July 1,882 cases. In compare with Plasmodium falciparum showed a moderate presence early in the year but peaked significantly in October and November as presented in Table 1.

Table 1: Distribution of Malarial cases in 2023 in Hyderabad

Month	P. vivax N(%)	P. falciparum N(%)	Mix N(%)	Total Number of positive cases N (%)
Jan-23	221 (1.20%)	146 (6.70%)	2 (1.40%)	369 (1.80%)
Feb-23	212 (1.10%)	67 (3.10%)	9 (6.10%)	288 (1.40%)
Mar-23	339 (1.80%)	82 (3.80%)	2 (1.40%)	423 (2.00%)
Apr-23	345 (1.90%)	42 (1.90%)	2 (1.40%)	439 (2.10%)
May-23	1209 (6.50%)	58 (2.70%)	6 (4.10%)	1273 (6.10%)
Jun-23	1741 (9.40%)	60 (2.70%)	1 (0.70%)	1802 (8.60%)
Jul-23	1882 (10.10%)	41 (1.90%)	5 (3.40%)	1928 (9.20%)
Aug-23	3507 (18.90%)	125 (5.70%)	15 (10.20%)	3647 (17.40%)
Sep-23	3141 (16.90%)	291 (13.30%)	29 (19.70%)	3461 (16.50%)
Oct-23	2159 (11.60%)	513 (23.50%)	25 (17.00%)	2697 (12.90%)
Nov-23	1356 (7.30%)	515 (23.60%)	29 (19.70%)	1900 (9.10%)
Dec-23	993 (5.30%)	243 (11.10%)	12 (8.20%)	1248 (6.00%)

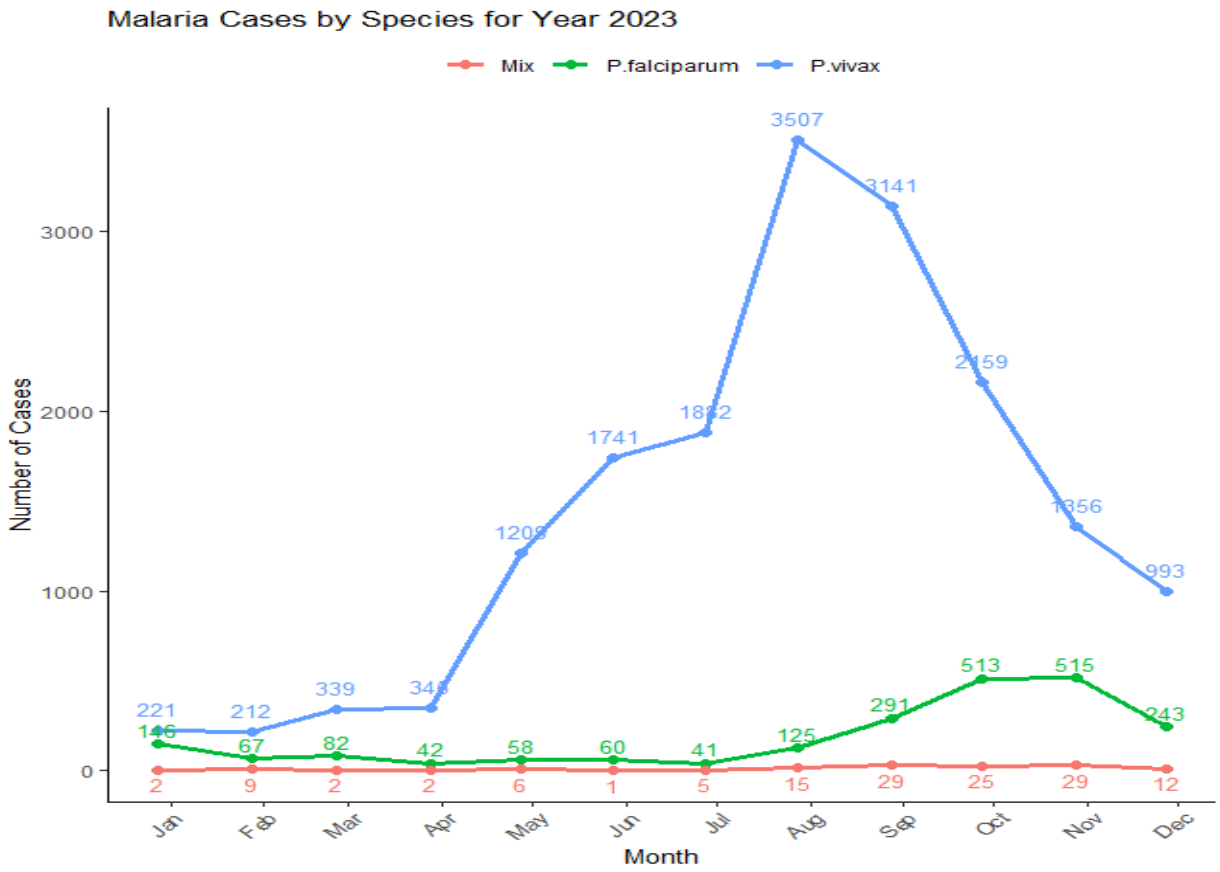
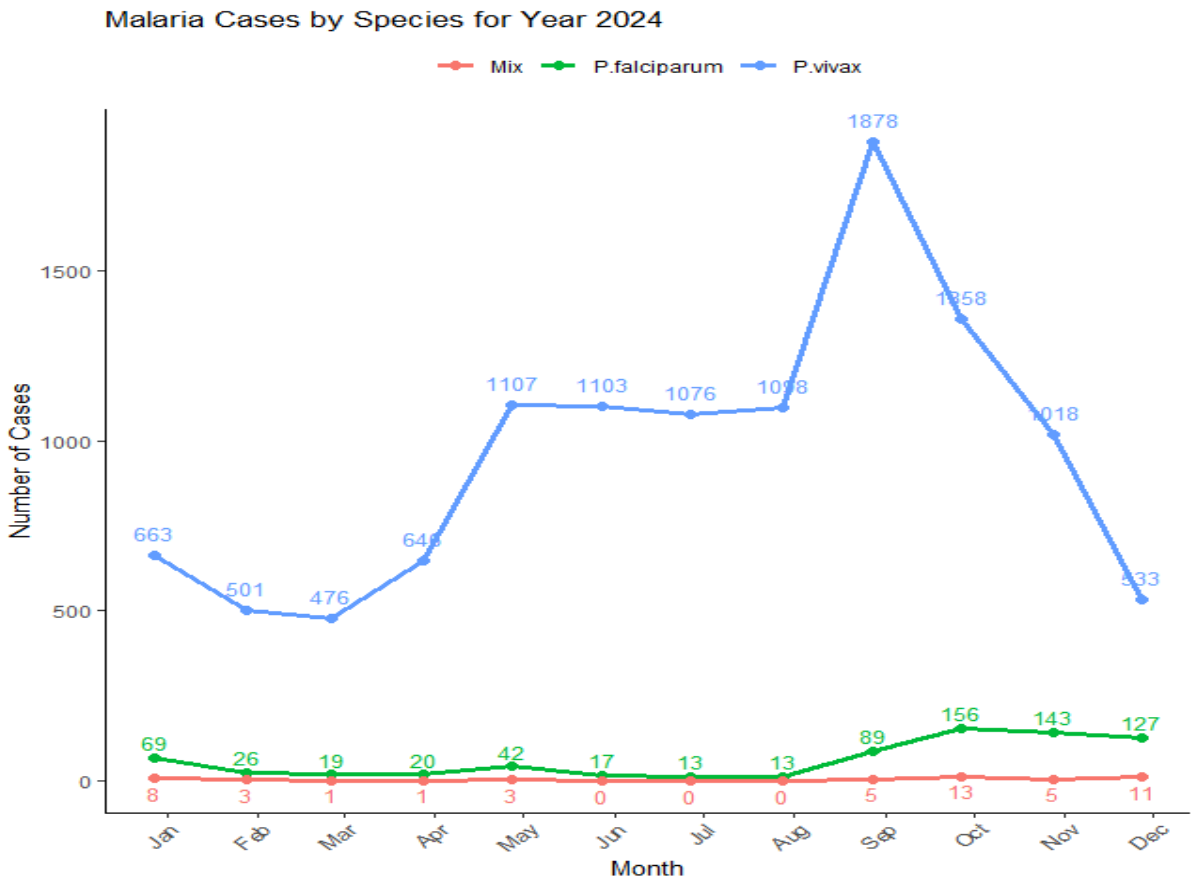


Table 2: Distribution of Malarial cases in 2024 in Hyderabad.

Month	**P. vivax N(%)**	**P. falciparum N(%)**	**Mix N(%)**	**Total Number of positive cases N (%)**
Jan-24	663 (4.95%)	69 (0.49%)	8 (0.06%)	740 (5.21%)
Feb-24	501 (3.74%)	26 (0.18%)	3 (0.02%)	530 (3.73%)
Mar-24	476 (3.55%)	19 (0.13%)	1 (0.01%)	496 (3.49%)
Apr-24	646 (4.82%)	20 (0.14%)	1 (0.01%)	667 (4.69%)
May-24	1107 (8.26%)	42 (0.30%)	3 (0.02%)	1152 (8.11%)
Jun-24	1103 (8.22%)	17 (0.12%)	0 (0.00%)	1120 (7.88%)
Jul-24	1076 (8.02%)	13 (0.09%)	0 (0.00%)	1089 (7.66%)

Aug-24	1098 (8.19%)	13 (0.09%)	0 (0.00%)	1111 (7.82%)
Sep-24	1878 (13.22%)	89 (0.63%)	5 (0.04%)	1972 (13.88%)
Oct-24	1358 (9.56%)	156 (1.10%)	13 (0.09%)	1527 (10.75%)
Nov-24	1018 (7.17%)	143 (1.01%)	5 (0.04%)	1166 (8.20%)
Dec-24	533 (3.87%)	127 (0.89%)	11 (0.08%)	671 (4.72%)

In 2024 total 89,527 slides were examined out of which 12,241 cases were found positive for malaria. Furthermore 11,457 cases had Plasmodium vivax 734 cases had Plasmodium falciparum and 50 cases had mix infection. The monthly trend of malaria cases for the year 2024, highlighting a clear dominance of P. vivax infections compared to Plasmodium falciparum and mixed cases. P. vivax cases began the year moderately high in January however decreased in February and March before rising again in April. A noticeable surge occurred from May onwards, with cases exceeding 1,100 from May to August, culminating in a sharp peak in September with 1,878 cases the highest monthly count recorded for any species. After September, a steady decline is observed through October to December. P. falciparum infections remained consistently low throughout the year but exhibited a gradual increase from September to a peak in October before a slight decline in November and December.



5. Discussion

According to this study Malarial cases detected between 2023-2024 showed Plasmodium vivax ranked as the first most prevalent specie in Hyderabad followed by Plasmodium falciparum as second most leading specie in malaria. Muhammad Imran et al carried-out research on the prevalence of malaria in Pakistan 79% cases had Plasmodium vivax while 16% cases had Plasmodium falciparum and only 4% cases had mix infection. Moreover, he observed during his study Karachi presented highest 99% of malaria cases however Larkana presented lowest 1.6% cases. According to his study occurrence of malaria prominently show diverge result in every district [7].

Our study highlights that in Hyderabad during 2023, the highest number of cases 3,647 were noticed in the month of August however second highest were noticed in the month of September with 3164 cases and lowest cases 288 were observed in the month of February. Arshia et al. analyzed the occurrence of malaria in Quetta (Pakistan) during 2017-2018. They collected 2200 slides from schools 434 was confirmed with malaria. According to this research 84% cases showed higher occurrence in Plasmodium vivax whereas only 6% cases showed Plasmodium falciparum. Plasmodium vivax was verified as the most prevalent specie in this research. Moreover monthly evaluation was also done during this period, prevalence of malaria was high in August 92% and low in March 57% [8].

In 2024 our study detected that Plasmodium vivax is widespread specie in Hyderabad while Plasmodium falciparum followed it. Another research was carried out from Khuzdar (Pakistan) during 2018-19 on school age children. Overall 334 slides were detected positive for malaria, most of the cases 67% had Plasmodium vivax,16% cases had Plasmodium falciparum however 17% had mix infection [9]. Bhag Chand Lohano from Hayderabad, Sindh carried out research on 154 patients out of which most of the 118 cases were found positive for Plasmodium vivax whereas 34 suffered from Plasmodium falciparum. According to this research Plasmodium vivax shows same more widespread specie in Hyderabad like our finding [1].

The less number of cases in a month indicates that many climatic factors like low temperature and humidity reduces the mosquito breeding activity. Low temperature and less humidity can shorten the lifespan of mosquitoes and limiting the opportunity for malaria transmission. In our finding also less cases were observed in the month of February 288 (1.40%) in the year 2023. A research was conducted in District Swat (Pakistan) malarial cases were inspected, from the collective data highest prevalence was in the month of July 40% and Lowest cases were seen in the month of February 2%. [10].

High plasmodium vivax cases during 2023-2024 are due to the parasite and vector wider geographical rang. Plasmodium vivax increases the infection risk at higher level because it has the capability to infect humans in tropical, subtropical and even temperate zone. A research was carried out in Karachi in January to December 2020, the highest prevalence was observed in Plasmodium vivax 89% patients and lowest prevalence were observed in Plasmodium falciparum 11% patients. In Karachi Plasmodium vivax is also a widespread specie just like Hyderabad district [11]. Moreover, in Multan (Pakistan) malarial cases were studied out of which 92% cases showed Plasmodium vivax whereas only 8% cases showed Plasmodium falciparum. It indicates high prevalence rate of Plasmodium vivax in Multan city like Hyderabad district [12].

In our study monthly trends of malaria showed that significant difference was found in frequency, incidence of malaria increase after March to May and peak in September to October, in 2022 similar study of malarial cases were surveyed in district charsadda (Pakistan). According to this study the prevalence of malaria was more in the month of June and July. Additionally, increase in rainfall can increase the trend because of higher malaria breeding and transmission rate. [13]. Fazal Manzoor carried out research in 2014 in a tertiary care hospital Karachi (Pakistan). The summer months like June to August showed highest number of cases whereas in winter months like December to February showed a smaller number of cases as compared to summers. Plasmodium vivax was shown highest patients record with 94% besides 6% was observed in Plasmodium falciparum.

6. Conclusion

Malaria remains a significant public health problem in Sindh, Pakistan. We compared prevalence of malaria of 2023 with 2024 in Hyderabad, surprisingly 2023 showed more

number of cases than 2024. This study highlights that in Hyderabad the most prevalent specie is Plasmodium vivax followed by Plasmodium falciparum and less cases showed mix infection. A lot of cases were detected in August to October. The rise of malaria cases during these months are because of Predominant effect of Plasmodium vivax in Hyderabad region. There is a need to create more awareness about malaria and vector prevention. Timely and effective fumigation is necessary. Proper laboratory diagnosis is significant aspect to reduce the illness and death.

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Novelty Statement:

This work is not previously studied hence the work is novel and would be beneficial for health.

Author's Contribution:

Zarina Chang: Collected data concluded data and wrote paper.

Dr Nadir Ali Birmani: Supervised the work and finalized the manuscript.

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