NANGARHAR UNIVERSITY
INTERNATIONAL JOURNAL OF BIOSCIENCES
ORIGINAL ARTICLE
e-ISSN: 2957-9988
NUIJB Vol 5, Issue 1 | 2026

Received: 16 Mar 2026 Accepted after revision: 28 Mar 2026 Published Online: 31 Mar 2026

Malaria Situation in Khas Kunar, Afghanistan: An Analysis of Recorded Data 2016-2023

Arifzai Roohullah[1*], Safi Ikhtiyar Mohammad[2], and Siddiqi Intizar[3]
[1,2,] Department of Biology, Sayed Jamaluddin Afghani University, Kunar City, Kunar, Afghanistan.
[3]Department of Chemistry, Sayed Jamaluddin Afghani University, Kunar City, Kunar, Afghanistan.

*Corresponding author: roohullaharifzai@gmail.com

ABSTRACT

Malaria remains one of the most significant global health challenges, with approximately 350 million people worldwide at risk of infection. Afghanistan is among the countries with a high prevalence of malaria. This descriptive study analyzed malaria data collected from Khas Kunar District over an eight-year period (2016–2023). Primary data were obtained from hospital records through active and passive surveillance systems. Demographic information and Plasmodium species identification were recorded. Data were analyzed using Microsoft Excel and presented in tables and graphs. A total of 4,177 confirmed malaria cases were recorded, including 2,037 males and 2,140 females. Approximately 20% of cases occurred in children under five years of age, while 80% were in individuals above five years. The majority of infections were caused by *Plasmodium vivax*, while only 20 cases were attributed to *Plasmodium falciparum*. Seasonal trends showed peak transmission during warmer months (June-September). Malaria remains a significant public health issue in Khas Kunar District, with clear seasonal patterns and dominance of *P. vivax*. The declining trend in cases suggests improvements in control measures, but continued surveillance and targeted interventions remain essential.

Keywords: Malaria, Plasmodium, Anopheles, Khas Kunar.

INTRODUCTION

Malaria is a severe and often life-threatening disease caused by Plasmodium parasites, transmitted via the bite of infected female Anopheles mosquitoes. During feeding, these mosquitoes inject Plasmodium sporozoites into the human bloodstream, initiating infection (Siddiqui et al., 2022; Mosawi et al., 2020). Malaria has been recognized since antiquity, with its symptoms initially ascribed to 'miasma' or 'bad air' from Marshlands—a belief that endured for over two millennia. The disease's parasitic etiology was first demonstrated in 1880 by Charles Laveran, while Ronald Ross's 1897 discovery of mosquitoes as vectors for avian malaria, later confirmed for human malaria by Italian researchers (1898-1900), established the complete transmission cycle (Arsin & Qanbari, 2025; Fikadu & Ashenafi, 2023). This disease is caused by five species of Plasmodium: P. falciparum, P. vivax, P. ovale, P. malariae, and P. knowlesi (Adrienne J. S, etal., 2025).

Most cases of falciparum occur in Africa. However, the Plasmodium vivax has a wide geographic distribution. Among these, 12 countries in the Eastern Mediterranean are considered endemic for malaria. Although malaria incidence in these countries decreased by 75% between 2000 and 2013. the 2013 report indicated that 280 million people in these 12 countries were infected with the disease, of which or including about 104 million lived in high risk areas. Compared to Iran and Saudi Arabia where transmission is low, the disease remains highly prevalent in six countries: Afghanistan, Djibouti, Pakistan, Somalia, Sudan, and Yemen (WHO, 2013; WHO, 2014). Every year, from 1 to 3 billion people in 103 different countries are infected with malaria, 40% of the world's population faces the risk of malaria, and on average, it causes between one to three million deaths annually (WHO, 2014).

Malaria remains a major public health challenge in Afghanistan, especially in the eastern and southeastern provinces. According to a 2016 report from the Ministry of Public Health, a total of 375,000 malaria cases were registered nationwide, with roughly half receiving treatment. In 2017, Plasmodium vivax (P. vivax) accounted for 89% of infections, while the more severe Plasmodium falciparum (P. falciparum) represented 11% of cases concentrated in six provinces: Nangarhar, Laghman, Kunar, Nuristan, Khost, and Paktika. The case fatality rate was 10%, with seven deaths reported in Nangarhar, two in

Kabul, and one in Kunar (Nemat, et al, 2024). Moreover, malaria cases decreased by 67% between 2016 and 2022 (Mahmoodi, 2024).

Figure 1. Provinces of Afghanistan showing malaria incidence (2017).

Studies conducted from 2000 to 2013 in the Eastern Mediterranean region on malaria indicate that most cases were caused by Plasmodium falciparum. However, in Afghanistan, Pakistan, and Iran, approximately 82% of cases were attributed to Plasmodium vivax, 18% to Plasmodium falciparum, with a small proportion caused by Plasmodium ovale. Of the over 400 Anopheles species identified, approximately 40 act as competent malaria vectors. Among these, Anopheles fluviatilis, Anopheles culicifacies, Anopheles stephensi, and Anopheles superpictus are the most epidemiologically significant in the region (Hanafi-Bojd, et al, 2012). In 2000, the number of deaths from the disease in the Eastern Mediterranean region was 2,166, declining to 1,027 by 2013 (Murray, et al, 2012)

WHO surveillance data (2020) indicates 241 million malaria cases globally, with 627,000 attributable deaths. Sub-Saharan Africa accounts for 95% of mortality, disproportionately affecting under-five children (67% of deaths) and pregnant women (WHO, 2020; Mahmoodi, et al, 2022)

The World Health Organization (WHO) 2020 reported a significant surge in the global malaria burden, with cases increasing by 14 million and deaths rising by 69,000 compared to 2019. Notably, two-thirds of these fatalities were attributed to disruptions in malaria prevention, diagnosis, and treatment services resulting from the COVID-19 pandemic. Geospatial analysis revealed that the majority of malaria-related deaths were concentrated in four high-burden countries: Nigeria, the Democratic Republic of the Congo, Uganda, and Mozambique, collectively accounting for nearly half of global mortality. In response, WHO outlined an elimination strategy, with 25 additional countries targeted for malaria eradication by 2025. These nations are currently receiving tailored technical support, including enhanced surveillance and vector control measures, to accelerate progress toward this public health goal (WHO, 2021; WHO, 2023).

Afghanistan has the third-highest global malaria burden, contributing to 11% of cases in the WHO Eastern Mediterranean Region (WHO,2017). Plasmodium vivax (PV) accounts for 95% of infections, followed by Plasmodium falciparum (PF) at 5%. Approximately 76% of the population resides in high-risk zones, with 123 districts classified as high-risk and 213 as low-risk. The eastern region bears the highest disease burden. In 2017, the confirmed malaria incidence was 8 cases per 1,000 populations, with a slide positivity rate (SPR) of 17.64% (Nemat, et al, 2024; NMSP, 2017).

This disease represents a significant public health burden in tropical regions and areas with elevations ≤1,500 meters above sea level. It also poses substantial risks to populations in non-endemic regions, including migrants. This epidemiological pattern explains why >90% of global malaria cases occur in tropical Africa, with children under five years of age disproportionately affected (NMSP, 2017). Afghanistan is among the countries with a high prevalence of malaria, particularly in its eastern and southeastern regions, where communities face numerous challenges. This study provides a detailed epidemiological analysis of malaria in Khas Kunar District, Kunar Province, Afghanistan, from 2016 to 2023. The findings aim to support public health strategies and policy-making for malaria control in the country. Additionally, the research outcomes can serve as a valuable reference for future scientific studies on malaria epidemiology in similar contexts. In Khas Kunar District of Kunar Province, 12,967 suspected malaria cases were tested between 2016 and 2023, with 4,177 (32.2%) confirmed as positive

MATERIALS AND METHODS

Study Area

Primary data were collected in collaboration with the Central Hospital of Khas Kunar District, located in Kunar Province, eastern Afghanistan. The hospital serves as a key healthcare facility for the surrounding population and was selected as the main site for data collection in this study.

Samples Collection

The study included malaria patients whose cases were fully documented between 2016–2023 through active and passive surveillance systems. Demographic data (age and gender) and parasite species were recorded.

Statistical Analysis

Data analysis was performed using SPSS. Results were presented in tables and graphical formats. Additionally, a structured literature review was conducted, including 30 scientific articles, of which 16 met the inclusion criteria and were directly relevant to the study.

RESULTS

Malaria Cases by Year and Demographics

The malaria situation in Khas Kunar District from 2016 to 2023 is summarized as follows. Data analysis indicates that in 2016, malaria cases reached 1,061 individuals, comprising 519 male and 542 female patients. Among these, 212 were children under five years of age, while 849 were individuals aged five or older. Notably, 1,059 cases involved Plasmodium vivax infection, with only two cases caused by Plasmodium falciparum.

In 2017, a total of 1,017 malaria cases were reported, with Plasmodium vivax accounting for the majority (1,011 cases), while Plasmodium falciparum was responsible for only six cases. The gender distribution revealed 497 male and 520 female patients. Furthermore, age stratification showed that 202 cases (19.9%) occurred in children under five years of age, whereas 815 cases (80.1%) were recorded in individuals aged five years or older. These findings highlight the predominance of P. vivax infections and provide insights into the demographic characteristics of malaria cases during the study period.

In 2018, 632 malaria cases were confirmed. Plasmodium vivax accounted for 625 infections (98.9%), while Plasmodium falciparum caused only 7 cases (1.1%). The gender distribution showed 310 males (49.1%) and 322 females (50.9%) patients. Age stratification identified 125 cases (19.8%) in children <5 years, compared to 507 cases (80.2%) in individuals aged ≥5 years. These findings highlight P. vivax dominance and elevated transmission among older age groups in the region.

In 2019, a total of 292 malaria cases were reported. Among these, 290 cases (99.3%) were caused by Plasmodium vivax, while only 2 cases (0.7%) were attributed to Plasmodium falciparum. The gender distribution showed 142 males (48.6%) and 150 females (51.4%) patients. Age-wise classification revealed 58 cases (19.9%) in children under five years of age, compared to 234 cases (80.1%) in individuals aged five years or older.

In 2020, a total of 265 malaria cases were reported, with Plasmodium vivax infections accounting for 263 cases (99.2%) and Plasmodium falciparum for the remaining 2 (0.8%). Demographic analysis revealed that 129 patients (48.7%) were male and 136 (51.3%) were female. Furthermore, age distribution showed that 58 cases (21.9%) occurred in children under five years of age, whereas 207 cases (78.1%) were in individuals older than five.

According to the 2021 annual surveillance report, a total of 307 malaria cases were documented. Among these, Plasmodium vivax accounted for 306 cases (99.7%), while only one case (0.3%) was attributed to Plasmodium falciparum. Gender distribution revealed 150 (48.9%) male and 157 (51.1%) female patients. Furthermore, age stratification demonstrated that 61 cases (19.9%) occurred in children under five years of age, compared to 247 cases (80.1%) in individuals aged five years or older.

The 2022 annual report indicates that a total of 316 malaria cases were recorded, all of which were attributed to Plasmodium vivax, with no cases of Plasmodium falciparum reported. Additionally, age distribution showed that 63 cases (19.9%) occurred in children under five years, while 253 cases (80.1%) were recorded in individuals aged five years or older.

The 2023 malaria surveillance data identified 287 confirmed cases, consisting of 141 males (49.1%) and 146 females (50.9%) patients. Age stratification revealed 57 cases (19.9%) in children under five years compared to 230 cases (80.1%) in individuals ≥5 years (χ^2=105.7, p<0.001), indicating significantly higher transmission among older age groups.

Table 1. Malaria Epidemiology in Khas Kunar District (2016-2023).

No	Year	Total Cases	Male	Female	0–5 Year	>5 Years	P. vivax	P. falciparum
1	2016	1061	519	542	212	849	1059	**2**
2	2017	1017	497	520	202	815	1011	**6**
3	2018	632	310	322	125	507	625	**7**
4	2019	292	142	152	58	234	290	**2**
5	2020	265	129	136	58	207	263	**2**
6	2021	307	150	157	60	247	306	**1**
7	2022	316	155	161	63	253	316	**0**
8	2023	187	141	146	57	230	287	**0**

DISCUSSION

Malaria remains a significant public health concern in endemic regions, including Afghanistan. The present study conducted in Khas Kunar District (2016–2023) recorded 4,177 confirmed cases, demonstrating a nearly equal gender distribution. This finding is consistent with studies conducted in Afghanistan and neighboring countries, where both males and females are similarly exposed due to shared environmental and household risk factors (Siddiqui et al., 2022; Nemat et al., 2024).

The age distribution observed in this study, with approximately 80% of cases occurring in individuals above five years of age, contrasts with global reports—particularly from sub-Saharan Africa—where children under five bear the highest burden (WHO, 2020). However, this pattern is consistent with findings from regions with relatively stable transmission, such as Afghanistan and parts of South Asia, where partial immunity develops over time, shifting disease burden toward older age groups (Mahmoodi et al., 2022).

The overwhelming predominance of Plasmodium vivax (99.52%) over Plasmodium falciparum (<1%) in this study strongly aligns with national surveillance data from Afghanistan, where P. vivax accounts for approximately 90–95% of malaria cases (NMSP, 2017; Nemat et al., 2024). Similar species distribution has also been reported in neighboring countries such as Iran and Pakistan (Hanafi-Bojd et al., 2012). In contrast, studies from sub-Saharan Africa report P. falciparum as the dominant species, indicating clear geographical variation in malaria epidemiology (WHO, 2020).

A marked decline in malaria cases was observed from 2016 to 2023, which is consistent with previous national and regional reports demonstrating a reduction in malaria incidence

following the scale-up of community-based interventions, improved diagnostic facilities, and enhanced vector control strategies (Mahmoodi, 2024; Mahmoodi et al., 2022). However, it is important to consider that variations in surveillance quality, reporting systems, and healthcare access may

Overall, the findings of this study are largely consistent with existing literature on malaria epidemiology in Afghanistan and the broader region. However, the higher burden observed in individuals above five years highlights the need for age-inclusive intervention strategies rather than focusing exclusively on under-five children. Additionally, the persistent dominance of P. vivax suggests that elimination strategies must prioritize relapse prevention and radical cure approaches, particularly targeting hypnozoite stages.

CONCLUSION

This study highlights the continued public health burden of malaria in Kunar Province, Afghanistan, with Plasmodium vivax identified as the predominant causative species. The nearly equal distribution between males and females, along with the higher prevalence among individuals over five years of age, indicates widespread exposure across the population.

The observed decline in malaria cases from 2016 to 2023 suggests progress in control measures, including improved diagnosis and treatment; however, sustained efforts are essential to further reduce transmission.

Overall, strengthening surveillance systems, promoting early diagnosis, and enhancing community-based interventions remain critical to achieving long-term malaria control and moving toward elimination in the region.

ACKNOWLEDGMENT: The authors would like to acknowledge the support provided by Khas Kunar central hospital for facilitating access to the data used in this study.

CONFLICT OF INTEREST: All authors declare no conflict of interest

FUNDING: This research received no external funding.

AUTHORS CONTRIBUTIONS:

All authors contributed to conceptualization, methodology, analysis, writing, and revision of the manuscript.

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