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Original Research

A Six Years (2016 – 2021) Trend of Malaria Prevalence in Gidami General Hospital, Western Ethiopia

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Abstract

This study aims to assess the trend of malaria cases at Gidami General Hospital (GGH) during a six-year period. Malaria case trends from 2016–2021, as recorded in the hospital's log book, are the subject of this study. According to the results, there were 401 malaria cases in 2016, 701 in 2017, 61 in 2018, 45 in 2019, 37 in 2020, and 29 in 2021 at GGH. The highest recorded number of malaria cases was 701 (55.02%) in 2017, while the lowest was 29 (2.28%) in 2021. Malaria cases have generally been declining over the past six years, with the notable exception of 2017, when the number of cases spiked dramatically. While P. vivax was the second most common plasmodium parasite tested for in this region, P. falciparum was the most common. Significantly more people in the 26-35 age bracket were impacted than those in the 18-25, over-36, and under-18 age brackets. The prevalence of malaria was higher in males than in females. Longitudinal studies of active malaria cases in the community based on house-to-house contact are crucial for understanding the disease's temporal and spatial distribution and for organising treatments in the research setting.

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INTRODUCTION

A major public health concern on a worldwide scale, malaria persists. In 2021, there were almost 247 million cases of malaria reported globally (WHO, 2022). From 2000 to 2015, the case counts of malaria in the 108 nations that experienced an epidemic in 2000 decreased from 245 million to 230 million, as reported in the 2022 World Malaria Report. Malaria cases, however, have been on the rise since 2016. In the first year of the COVID-19 pandemic, which occurred in 2020 and 2019 (WHO, 2022). The highest yearly rise of cases was 13 million. Much of the rise in case counts during the past five years occurred in the countries that make up the WHO African Region (WHO, 2022). Nearly all instances (95% and 96%, respectively) occurred in this region; in 2021, the proportion of fatalities affecting children under five years old decreased to 78.9% from 91.0% in 2000 (WHO, 2022). In Ethiopia, areas lower than 2000 meters above sea level are particularly vulnerable to malaria, an infectious tropical ailment that is endemic to the country. Approximately 60% of Ethiopians reside in regions where malaria is prevalent, putting 68% of the population at risk of getting the disease (FMOH, 2014). In the country, malaria is a seasonal pandemic that is largely caused by changes in altitude and climate (Abose et al., 1998; Abeku et al., 2003; Deribew et al., 2017). Disease transmission peaks between September and December, which also happens to be the primary rainy season, according to Deribew et al. (2017) and Abeku et al. (2003). From April through May, there is also a short transmission season. Western Oromia, Amhara, Tigray, and the Southern Nation, Nationality, and Peoples' Region (SNNP) are among of the most malaria-prone areas in Ethiopia, along with much of Benishangul, Gumuz, and Gambella (Sema & Waktola, 2022).

According to research conducted by Abose et al. (1998) and FMOH (2020), the sole malaria vector in the country is Anopheles arabiensis, a species within the Anopheles family. Plasmodium falciparum and Plasmodium vivax are the two most frequent malaria parasites in the country. Approximately 60% and 40% of all malaria cases are caused by these two species, respectively (Deribew et al., 2015; Solomon et al., 2020). Since the agricultural months align with the peak transmission season of malaria, this disease has a detrimental effect on the nation's development and production (FMOH, 2014).

There has been a marked decline in malaria-related illness and death in Ethiopia since 2015. For example, according to the FMOH (2020), the number of confirmed cases of malaria decreased by 47% from 2016 to 2019. Using this wave of success as a springboard, the country has lofty goals: to abolish malaria by the year 2030. Presently, the country has developed a national strategy plan that aims to eradicate malaria from 2021 to 2025 (FMOH, 2020). But there are obstacles to maintaining the gains of the last 20 years, such as a lack of resources for the country's western region, disorganized program management teams, aged infrastructure, especially in places that require extra help, and the recent COVID-19 pandemic's impact on prevention and elimination efforts (FMOH, 2020).

Primary frontline preventative methods against malaria in Ethiopia are indoor residual house spraying (IRS) and long-lasting insecticidal nets (LLINs), in addition to early and efficient anti-malarial drug therapy (FMOH, 2014). But LLINs, IRS, and anti-malarial drugs are in danger due to the increase of drug resistance in malaria parasites and the development of pesticide resistance in malaria vectors (Asale et al., 2021). To investigate the efficacy of malaria control strategies and the pattern of malaria occurrence, review studies of malaria performed at health institutions are essential. Health centers that serve remote areas, particularly in western Ethiopia, do not conduct nearly enough retrospective studies on malaria. By studying the patterns of malaria transmission in faraway, endemic areas, health officials could get a better understanding of the mechanisms of disease transmission. The researchers in this study set out to look at the six-year trend in malaria cases at Gidami General Hospital in western Ethiopia. The study must be carefully considered when developing interventions and strategies to manage or eliminate malaria.

MATERIALS AND METHODS

Study area and period

The research was conducted at Gidami General Hospital (GGH) in western Ethiopia from 2016 to 2021. GGH is located in the Kellem Wollega Zone of the Oromia Regional State (Figure 1). It is one of the border hospitals in Ethiopia's western area. Located about 688 kilometers west of Addis Ababa, the capital of Ethiopia, the hospital is in Gidami Town, the capital of the district. The lowest administrative division in Ethiopia, Gidami 01 and 02 gandas, are located in Gidami town. Additionally, GGH is present in Gidami 01. Geographically, Gidami District extends from an elevation of 1776 to 1928 meters above sea level and encompasses the longitude of 34037'E and the latitude of 8059'N.

Upper Blue Nile Valley is where you'll find the Gidami district. Malaria is endemic in the area and reaches its highest point in the months following the summer rains (September–December) and its lowest point (March–May) due to the relatively modest rainfall. Healthcare options in the area range from public to private institutions, with GGH serving as the only public hospital in the immediate vicinity.

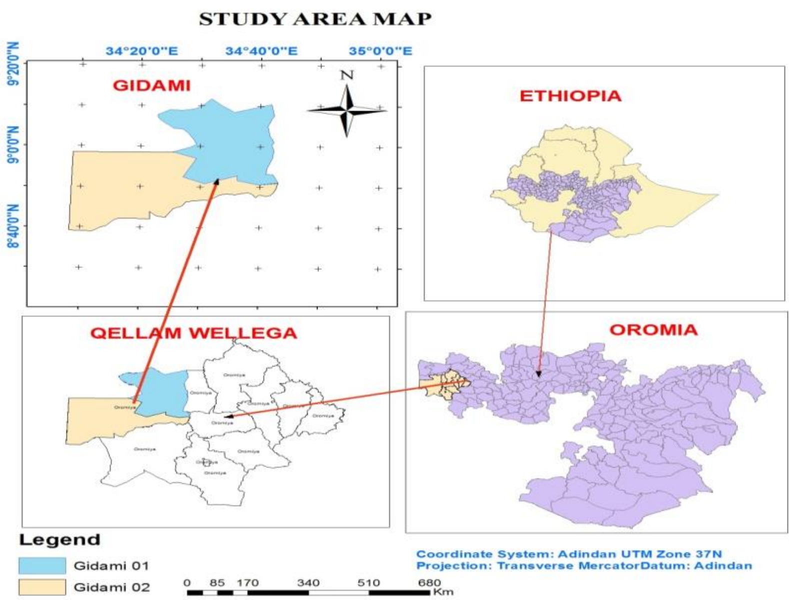

Figure 1 *Map of the study area and its location in Ethiopia*

Study Design

We looked at the blood film malaria registration laboratory logbook at GGH in Western Ethiopia from 2016 to 2021 to see how the prevalence of malaria changed over that time. The data used in the trend analysis for malaria was collected in the first four months of 2022.

Sampling Methods and Sample Size Determination

The GGH laboratory logbook was searched for six years' worth of malaria data beginning in 2016. The data was collected using a specific form that asked for the following: year, month, sex, age, residence, and the type of malaria parasite (P. falciparum, P. vivax, or mixed infections). When testing for malaria parasites in GGH, microscopy is the method of choice for determining the species of parasites. In line with standard WHO protocol, we took capillary blood samples from patients who had clinical suspicions so that we could make thin and thick blood films. After the films were marked correctly, they were fixed with 100% methanol and left to air dry on a horizontal surface. After that, a 3% Giemsa solution was used to stain the films for half an hour, regardless of their thickness. Afterwards, parasites were examined microscopically by immersing blood films in 100× oil. If no parasites were found after scanning 100 fields, it was recorded as negative.

Data collection procedures

From 2016 to 2021, monthly reports of malaria cases were collected from the GGH registration book.

Data Analysis

The data was analyzed using SPSS version 20 after a completeness check. We used descriptive statistics to look at the number of instances of microscopically confirmed malaria by year. Specifically, species distributions of malaria in relation to clinically investigated and confirmed cases were summarized in a table for each year. Also, we used Pearson's Chi-square test to find out how the Plasmodium species related to age, sex, and location. The malaria prevalence was calculated by dividing the total number of research participants screened by the number of people who demonstrated Plasmodium species infection. The distribution of malaria species and the overall trend of malaria prevalence were displayed using graphs, taking into account factors such as habitation and season. For statistical purposes, a p-value of less than 0.05 was deemed significant.

Ethical clearance

Following approval from Wollega University's Ethical Committee, official letters were dispatched to all pertinent officials in Gidami Town, assuring their secrecy. The researchers were assisted in gathering the data by the personnel of the record office at Gidami General Hospital.

RESULTS AND DISCUSSIONS

Trend of Annual Malaria Case Prevalence

With the exception of 2017 and 2021, when the prevalence rate peaked at 701 (55.02%) and 29 (2.28%), respectively, out of 1274 malaria cases registered over the six-year period, the prevalence of cases was decreasing. There was a meteoric rise in malaria cases from 2016 to 2017, with 2017 seeing the highest total. Figure 2 shows that the number of cases fell precipitously between 2017 and 2018, and then stayed low for the years that followed.

Prevalence of Malaria Cases by Sex Group

Figure 1 shows the frequency of malaria cases in GGH broken down by sex. The male case rate of malaria was 790 (62%), which was significantly higher ($p<0.05$) than the female case rate of 484 (38%).

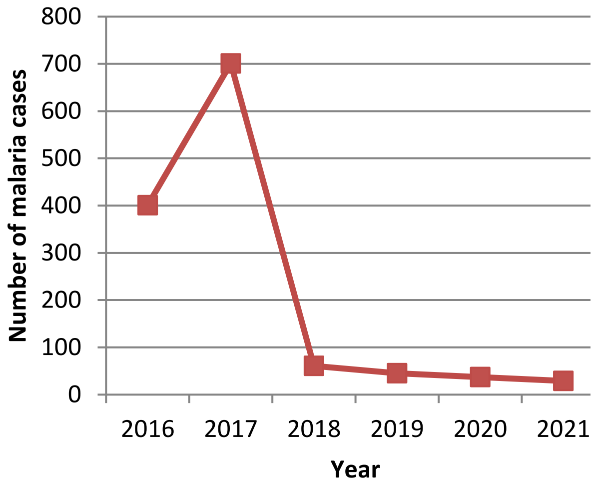

Figure 2 *Annual malaria case prevalence in Gidami General Hospital from 2016 - 2021*

Table 1

Prevalence of malaria cases by sex groups in GGH from 2016-2021

Year	Sample size					Malaria positive samples					M:F ratio	P- value
	M	%	F	%	Total	M	%	F	%	Total		
2016	286	71.32	115	28.68	401	280	69.83	121	30.17	401	1.4:1	
2017	396	56.5	305	43.5	701	403	57.5	298	45.5	701	1.3:1	
2018	43	70.49	18	29.51	61	41	67.21	20	32.79	61	1.2:1	0.000
2019	28	62.22	17	37.78	45	26	57.78	19	42.22	45	1.3:1	
2020	23	62.16	14	37.84	37	22	59.5	15	40.5	37	1.2:1	
2021	20	68.97	9	31.03	29	18	62.06	11	37.94	29	1.2:1	

Note: *M= Male, F= Female, M: F= Male to female ratio*

Prevalence of Malaria Cases by Age Groups

Throughout the study period, individuals in the age bracket of 26–35 had a significantly greater incidence of malaria ($p<0.05$) compared to those under 18, 18–25, and 36+ years old (Table 2).

Table 2

Prevalence of malaria by age groups in patients visiting GGH from 2016-2021

Age	Years							
	2016	2017	2018	2019	2020	2021	Total	P-Value
<18	21(1.65)	34(2.67)	7 (0.55)	8(0.63)	5(0.39)	3(0.24)	78(6.12)	
18-25	40(3.14)	43(3.37)	28(2.19)	15(1.18)	8(0.63)	7(0.55)	141(11.07)	
26-35	277(21.74%)	477(37.44)	19(1.49)	14(1.09)	18(1.41)	15(1.18)	820(64.36)	0.000
>36	63(4.95) %	147(11.54)	7(0.55)	8(0.63)	6(0.47)	4(0.31)	235(18.45)	
Total	401(31.48) %	701(55.02)	61(4.79)	45(3.53)	37(2.90)	29(2.28)	1274	

Seasonal Variation of Malaria Cases at Gidami General Hospital

Over the course of the years, malaria cases were recorded monthly in the study region (Figure 3). There were clear seasonal differences in the distribution of malaria cases by average monthly peak time at the hospital. Malaria cases were significantly higher on average following the moderate summer rains (March–May) and the severe summer rains (September–December) (Figure 3).

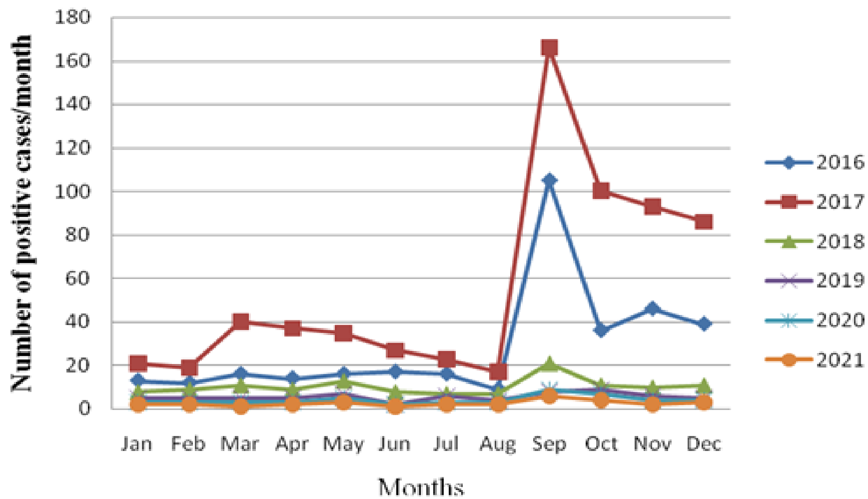

Figure 3 *Monthly variations of malaria cases at Gidami General Hospital from 2016-2021*

The prevalence of malaria parasites in Gidami General Hospital from 2016 - 2021

In a study of 1274 cases with microscopically confirmed malaria, blood films showed the presence of Plasmodium falciparum 803 (63.02), Plasmodium vivax 452 (35.48), and a mixed infection of 19 (1.5) (Figure 4).

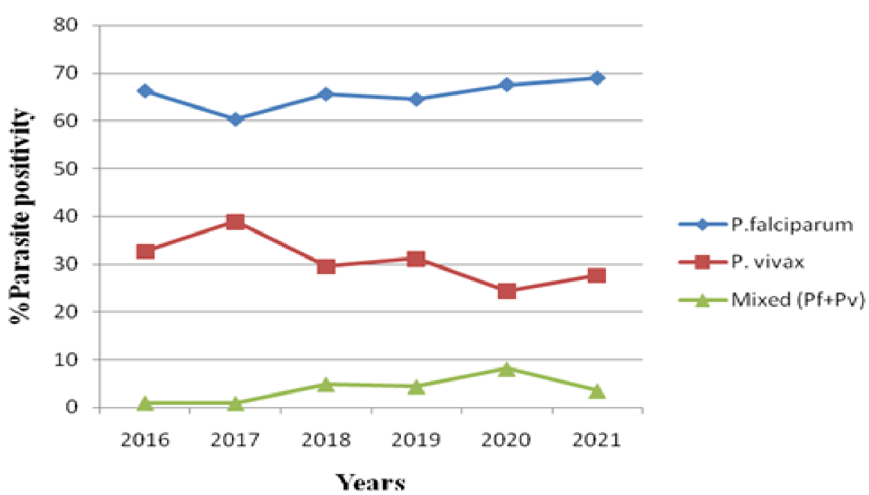

Figure 4 *Prevalence of malaria parasites in Gidami General Hospital from 2016 – 2021*

Annual malaria parasitic incidence at Gidami General Hospital from 2016 - 2021

Table 4 shows that, with the exception of 2017, the annual malaria parasite incidence (API) fell for the past six years, from 2016 to 2021. The API was132,243,32,21,18, and 16 in that sequence for each of the 1274 populations. The yearly parasite incidence of all Plasmodium species also declined, reaching a peak in 2017.

Table: 4

Annual malaria parasitic incidence at Gidami General Hospital from 2016 – 2021

Year	Confirmed malaria cases	API	P. falciparum	AFI	P. vivax	AVI	Mixed infection	AMII
2016	401	132	266	78	131	52	4	2
2017	701	243	423	168	272	72	6	3
2018	61	32	40	18	18	12	3	2
2019	45	21	29	13	14	7	2	1
2020	37	18	25	11	9	5	3	2
2021	29	16	20	10	8	5	1	1

API = Annual parasitic incidence, AFI = Annual falciparum incidence, AVI = Annual vivax incidence, AMII = Annual mixed infection incidence.

Microscopically confirmed cases of malaria and annual parasite incidence rates (API) of the disease in GGH declined from 2016 to 2021, with the exception of a significant surge in 2017. The decline in malaria cases and API rates makes it imperative to examine the research area's intervention tool coverage, ownership, and usage. The expansion of frontline malaria intervention tools in Ethiopia, particularly LLINs and IRS, may be associated with this decrease (FMOH, 2014; 2020). However, the highest recorded incidence of malaria in 2017 might have been influenced by seasonal changes in weather variables such as precipitation, temperature, and relative humidity. There is substantial seasonal, interannual, and spatial variability in malaria transmission across the country because of the wide range of topographic features, climatic conditions, human settlement patterns, and land use, vegetation cover, surface hydrology, temperature, and rainfall (FMOH, 2014). Understanding the impact of climate variables on the dynamics of malaria transmission in the study setting requires further research.

Malaria positive was higher in males (62.0%) compared to females (38.0%), according to the data. These results are expected, since it has been previously shown in Ethiopia (Alemu et al., 2012; Amenu, 2014; Hawaria et al., 2019; Dabaro et al., 2020) that males are more prone to malaria than women. There is a correlation between the higher incidence of malaria in males and the fact that they are more likely to be outdoors during the hours when mosquito bites are most common. In their 2016 study, Kenea et al. provided an explanation for this phenomena. Furthermore, men are at a higher risk of contracting malaria due to their higher frequency of migration as seasonal migrant workers in agricultural regions of the country that are endemic to the disease, such as the Gidami district. On the other hand, a study conducted in the Amhara region found that malaria is more common in females (60% vs. 40%) (Derbie & Mekonnen, 2017), which contradicts our result. Over the past six years, malaria cases have been recorded across all age groups. Nontheless, there was a statistically significant variation in GGH throughout the stated age ranges. Compared to those under 18, in the 18–25 age bracket, and those over 36 years old, those between 26 and 35 years old had a much higher risk of contracting malaria throughout the study period. These results were in line with what was found in the Wolaita Zone (Legesse et al., 2015) and the Raya Azebo district (Tesfaye et al., 2018). The discrepancy might be due to inadequate coverage of LLINs, considering that the majority of the study's subjects were adults. Young people in this age bracket are particularly susceptible to anopheles mosquito bites because of their energy and enthusiasm for farming. Their danger of catching the virus is higher because they go a long distance for education. This was in line with the results, as shown in previous studies conducted in Ethiopia (Alemu et al., 2012; Amenu, 2014; Hawaria et al., 2019; Dabaro et al., 2020).

The Gidami area is currently facing a persistent malaria pandemic that requires additional investigation, attention, and action, as evidenced by the monthly observations of cases in the study zone over the years. There were also significant seasonal changes in the distribution of malaria cases at the hospital's typical peak times each month. There was a statistically significant uptick in malaria cases from September through December, following the heavy summer rains. This is not surprising considering that the research is being conducted in the Upper Blue Nile Valley, a malaria-stricken area, and that the primary factors influencing peak seasonality are variations in altitude and climate (Abose et al., 1998; Abeku et al., 2003; Deribew et al., 2017). Disease transmission peaks between September and December, which also happens to be the primary rainy season, according to Deribew et al. (2017) and Abeku et al. (2003). From April through May, there is also a short transmission season.

Annual temperature and precipitation fluctuations affect mosquito vector breeding grounds, mosquito larvae development time, and malaria parasite growth rate inside the vector. Plasmodium falciparum and Plasmodium vivax were the two most prevalent plasmodium species in GGH, with 803 and 452 cases, respectively, accounting for 63.22% and 35.48% of the total cases, while mixed infections accounted for the remaining 19.5% (1.5). P. falciparum was more common than P. vivax in different parts of Ethiopia, according to this and other studies (FMOH, 2014; Alemu et al., 2012; Amenu, 2014; Ali and Animut, 2019). Nevertheless, a previous publication from Jimma Town (Alemu et al., 2011a) suggested that P. vivax was more common than P. falciparum, which contradicts our current conclusion. Possible causes of these differences include pharmaceutical resistance, the severity of the disease, and variations in program performance.

CONCLUSIONS

Malaria cases have generally been declining over the past six years, with the notable exception of 2017, when the number of cases spiked dramatically. While P. vivax was the second most common plasmodium parasite tested for in this region, P. falciparum was the most common. Significantly more people in the 26-35 age bracket were impacted than those in the 18-25, over-36, and under-18 age brackets. The prevalence of malaria was higher in males than in females. Longitudinal studies of active malaria cases in the community based on house-to-house contact are crucial for understanding the disease's temporal and spatial distribution and for organising treatments in the research setting.

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DECLARATION

The authors declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

All data included in the article are available from the corresponding author upon request

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