Ten Years Trend of Malaria Prevalence in Ziway Dugda District, Arsi Zone, Ethiopia 2011-2020

Million Getachew Mesfun
Arsi University College of Health Sciences
Shimelis Teshome Ayalneh (shimelisteshome35@gmail.com)
Arsi University College of Health Sciences https://orcid.org/0000-0002-0599-8282

Research

Keywords: Malaria, Trend, Prevalence, Ziway Dugda District, Ethiopia

Posted Date: October 5th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-934235/v1

Abstract

Background: Malaria has been one of the major public health problems in Ethiopia for decades. Recent reports from different part of the country showed that the trend of malaria is declining. However, there is a need for periodic assessing the trend of malaria in different malaria endemic areas of the country as part of the planed malaria elimination strategies.

Methods: Ten years retrospective data of blood film examination was collected from the laboratory registration book and monthly report of Ogolcho health center and analyzed to assess the trend of malaria prevalence in Ziway dugda distric, one of the malaria endemic areas in Arsi zone, Ethiopia.

Result: From the total of 38,094 malaria suspected patients, 4,863(12.8%) patients were malaria positive microscopically, with 3,301(67.9%) *P.vivax,* 1545(31.8%) *P.falciparum* and 17(0.35%) mixed infection. There was a fluctuating trend of malaria within the last ten years, with annual total cases of malaria ranged from 1685 in 2013 to 103 in 2020 and there was successive reduction in malaria prevalence from 2013 onwards.

Conclusion: Trend of malaria was declining in Ziway dugda district with shift in dominancy of the circulating species *(P.vivax*).

Background

Malaria is caused by a protozoan parasite called Plasmodium, which is transmitted via the bites of infected mosquitoes. According to the World Malaria Report 2015, there were 212 million cases of Malaria and 429,000 Malaria deaths globally in 2015 in which more than 90 % of deaths due to malaria were in Africa. Because of the favorable and conducive environment, the parasite and the vector population sustain well in most of African countries (WHO, 2015a).

Malaria is one of major public health problems in Ethiopia. Three fourth of the land mass of Ethiopia was considered to be malarious and about 68% of the population was at risk of malaria infection (Ayele et al., 2012). In 2014/2015, the total number of laboratory-confirmed plus clinical malaria cases were 2,174,707(Federal Ministry of health, 2015). This number has decreased significantly and recent reports from different part of the country showed that the trend of malaria is declining (Deribew et al., 2016, Yimer et al., 2017). This could be promising occasion which could show that the national plan of malaria elimination is achievable.

Even though there is general decline in the prevalence of malaria in the country, shift in species distribution with dominancy of *P.vivax* over *P.falciparm* has been reported from different studies (Yewhalaw et al., 2009, Woyessa A. Gemeda, 2012). This could be either due to the relapsing nature of the parasite or decreased efficacy of Chloroquine against *P.vivax*.

As part of the malaria control and elimination program, there is need to determine the trend of the disease in different part of the country so that we could have a clear picture of burden and trend of malaria in the country. Trends of a given disease could indicate the success or failure of interventions or polices designed against the disease. Hence, conducting trend analysis of malaria and assessing the current status of the disease is mandatory for a consistent and successful malaria control in the country. Despite the fact that Ziway Dugda district is malaria endemic area, there is no study done to determine the trend of malaria infection. Therefore, the main objective of this study was to assess the trend of prevalence of malaria in Ziway Dugda district.

Methods And Materials

Ziway Dugda district is malaria endemic district in the Oromia Regional State of Ethiopia with an estimated population size of 120,862. It is Part of the Arsi Zone located in the Great Rift Valley. The altitude of the district ranges from 1500 to 2300 meters above sea level. The main rainy season starts in June and extends to the end of September, while a short rainy season occurs from March to May. The mean annual maximum and minimum temperatures are 30.4 ^{O}C and 14 ^{O}C, respectively. There are five health centers in the district and the study was done was done in one of the health centers located in the administrative center for the district, Ogolcho.

Ogolch health center laboratory department is staffed with two senior laboratory technicians and one laboratory technologist with more than 5 years of experience on malaria microscopy. Malaria diagnosis is done in the laboratory using blood film examination according to the WHO guideline (WHO, 2010). Laboratory registration books are archived for long time. For this study purpose blood film results of patients diagnosed in the laboratory from January 2011 to December 2020 was collected from the laboratory registration book retrospectively. Data on sex, age, type of Plasmodium species and month was collected. The collected data was entered to SPSS version 26.0 statistical software for analysis.

Result

Ten years trend of malaria

Ten years retrospective data (January 2011 to December 2020) were collected from the log book and monthly report of Ogolcho health center. A total of 38,094 suspected patients were tested for malaria by blood film examination and 4,863(12.8%) were positive for malaria parasite. From the malaria positive patients, 2907(59.8%) were males and 1956(40.2%) were females. About half, 2321(47.7%), of the malaria infected patients were under five children (Table 1).

Table 1
Distribution of malaria species among malaria suspected patients (from the registration book and monthly report of ogolcho health center laboratory)

Malaria cases	Age group		
	< 5	>= 5	Total
	N(%)	N(%)	N(%)
P.falciparum	735(47.6)	810(52.4)	1545
P.vivax	1579(47.8)	1722(52.2)	3301
Mixed	7(41.2)	10(58.8)	17
From the total Malaria positive participant; 3,301(67.9%) were infected by *P.vivax* (Fig. 1).			

There was a fluctuating trend of malaria within the last ten years, with annual total cases of malaria ranged from 1685 in 2013 to 103 in 2020 and mean annual malaria cases of 487. There was statistically significant inter-annual variation of malaria cases occurrence in the study area ($p < 0.001$). There was a significant decline in the number of confirmed cases of malaria in 2020 compared to 2013($p < 0.001$). There was successive reduction in malaria prevalence from 2013 onwards (Fig. 2).

The highest peak of malaria cases in all years was observed during September. Even though there was no statistically significant variation of monthly malaria cases occurrence ($p = 0.137$) Fig. 3.

The season with the highest malaria cases occurrence was in summer (June, July and August) and the lowest malaria cases was observed during spring (September, October and November) but there was no statically significance to the seasonal variation of malaria cases ($p < 0.404$) (Fig. 4).

Discussion

Malaria has been a major public health problem globally for centuries. 3.2 billion People (half the world's population) were living in areas at risk of malaria transmission in 106 countries and territories last year. Malaria was the cause for the death of about one million individuals annually in which majority of the death was in Africa (WHO, 2015b). Ethiopia is one of the countries where more than half of the population is at risk of malaria (National Malaria Control Team et al., 2014).

Even though many preventive measures such as deployment of massive number of health extension workers, distribution of ITNs, IRS has been done; malaria is still one the major public health problem in some part of the country. As far as the general prevalence of malaria is considered, there is a decrease in its distribution globally. Between 2010 and 2015, malaria incidence rates fell by 21% globally and in the African Region. During this same period, malaria mortality rates fell by an estimated 29% globally and by 31% in the African Region. The malaria mortality rate among children under 5 also fell by an estimated 35% globally (WHO, 2015b).

According to the national malaria control strategy, Ethiopia is planning to eliminate malaria by 2030. There are promising findings which shows that the trend of malaria is reducing significantly and elimination of the disease from the country could be possible in the near future. The number of new cases of malaria declined from 2.8 million in 1990 to 621,345 in 2015. Malaria caused an estimated 30,323 deaths in 1990 and 1561 deaths in 2015, a 94.8% reduction over the 25 years (Deribew et al., 2017). Similar trend of malaria was also shown in the retrospective study done in Jimma (Alemu et al., 2011), Gilgel-gibe hydroelectric dam (Sena et al., 2014) and Bahir Dar (Yimer et al., 2017). Our study finding showed similar declining trend of malaria cases in Ziway Dugda district. In the last ten years the microscopically confirmed malaria cases were decreased from 1685 in 2013 to 103 in 2020. unlike other national studies, the highest malaria cases were reported from June to August (National Malaria Control Team et al., 2014). This could be due to the difference in the climate condition of the area (the area is hot with little rain in summer season).

Conclusion

The highest peak of malaria cases in all years was observed during September. The malaria prevalence in the study area showed a declining trend with shift in dominancy of the circulating species *(P.vivax*). This could indicate the national plan of malaria elimination in the country could be achievable.

Declarations

- **Ethics approval and consent to participate**

Ethical clearance for the study was obtained from the Ethical Review Board of Arsi University. Permission letters were obtained from Ziway dugda wereda health bureau and health center prior to data collection.

- **Consent for publication**

“Not applicable”

- **Availability of data and materials**

Data are however available from the authors upon reasonable request

- **Competing interests**

The authors declare that they have no competing interests.

- **Funding**

Arsi University

- **Authors' contributions**

Both MGM, and STA conducted the statistical analyses, developed first draft and revised the manuscript. All authors read and approved the final manuscript.

- **Acknowledgements**

We would like to express great thanks to the staffs of Ogolcho health center for their kind cooperation during the data collection.

- **Authors' information**

Million Getachew Mesfun

Department of Medical Laboratory Sciences, College of Health Sciences, Arsi University, Ethiopia

Shimelis Teshome Ayalneh

Department of Medical Laboratory Sciences, College of Health Sciences, Arsi University, Ethiopia

References

ALEMU A, ABEBE G, TSEGAYE W, GOLASSA L. Climatic variables and malaria transmission dynamics in Jimma town, southwest Ethiopia. Parasites Vectors. 2011;4:30.

AYELE DG, ZEWOTIR TT, MWAMBI HG. Prevalence and risk factors of malaria in Ethiopia. Malar J. 2012;11:195.

DERIBEW A, DEJENE T, MELAKU KEBEDE,BTESSEMA,GA, Y. A. & MISGANAW A. Incidence, prevalence and mortality rates of malaria in Ethiopia from 1990 to 2015: analysis of the global burden of diseases 2015. Malaria Journal. 2017;16:271.

DERIBEW A, DERIBE TESSEMA,GA, MELAKU K, LAKEW YA, Y. & AMARE AT. 2016. Trends, causes, and risk factors of mortality among children under 5 in Ethiopia, 1990–2013: findings from the Global Burden of Disease Study 2013. *Popul Health Metr*, 14.

FEDERAL MINISTRY OF HEALTH 2015. Health and Health Related Indicators 2007 E.C. (2015). Addis Ababa.

NATIONAL MALARIA CONTROL TEAM, ETHIOPIAN PUBLIC HEALTH INSTITUTE, WORLD HEALTH ORGANIZATION, ADDIS ABABA UNIVERSITY & PROJECT I. An epidemiological profile of malaria in Ethiopia. A report prepared for the. Federal Ministry of Health, Ethiopia, the Roll Back Malaria Partnership and the Department for International Development. UK; 2014.

SENA LD, DERESSA, W. A. & ALI AA. Analysis of trend of malaria prevalence in south-west Ethiopia: a retrospective comparative study. Malar J. 2014;13:188.

WHO 2010. WHO Basic Malaria Microscopy. *Part I Learner's Guide*. Geneva, Switzerland.

WHO. 2015a. World malaria report 2015 WHO. France.

WHO. Fact Sheet: World Malaria Report 2015. Switzerland: Geneva; 2015b.

WOYESSA A. GEMEDA. Shifting to Plasmodium Vivax Dominance At Highlands of Ethiopia Following the Countrywide Intensive Use of Artemether-Lumefantrine throughout Endemic Areas Since 2005: Can We Neglect the Role of Climate and Relapse Cases? 13th World Congress on Public Health. 2012 Addis Ababa.

YEWHALAW D, LEGESSE W, VAN BORTEL W, GEBRE-SELASSIE S, KLOOS H, DUCHATEAU L, SPEYBROECK N. Malaria and water resource development: the case of Gilgel-Gibe hydroelectric dam in Ethiopia. Malaria Journal. 2009;8:21.

YIMER M, HAILU T, ABERA MULU,W, B. & AYALEW W. A 5 year trend analysis of malaria prevalence with in the catchment areas of Felegehiwot referral Hospital, Bahir Dar city, northwest-Ethiopia: a retrospective study. BMC Research Notes. 2017;10:239.

Figures

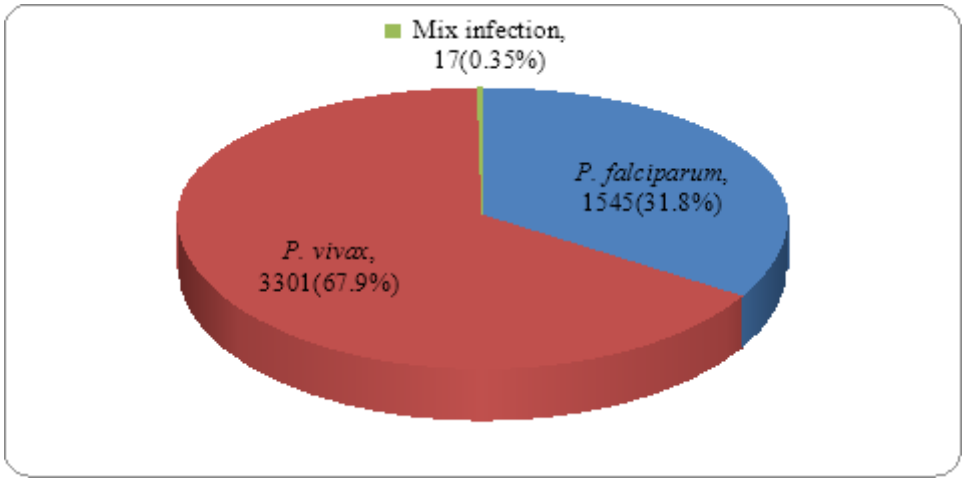

Figure 1

Pie chart of eleven years blood film examination result from Ogolcho health center, 2020

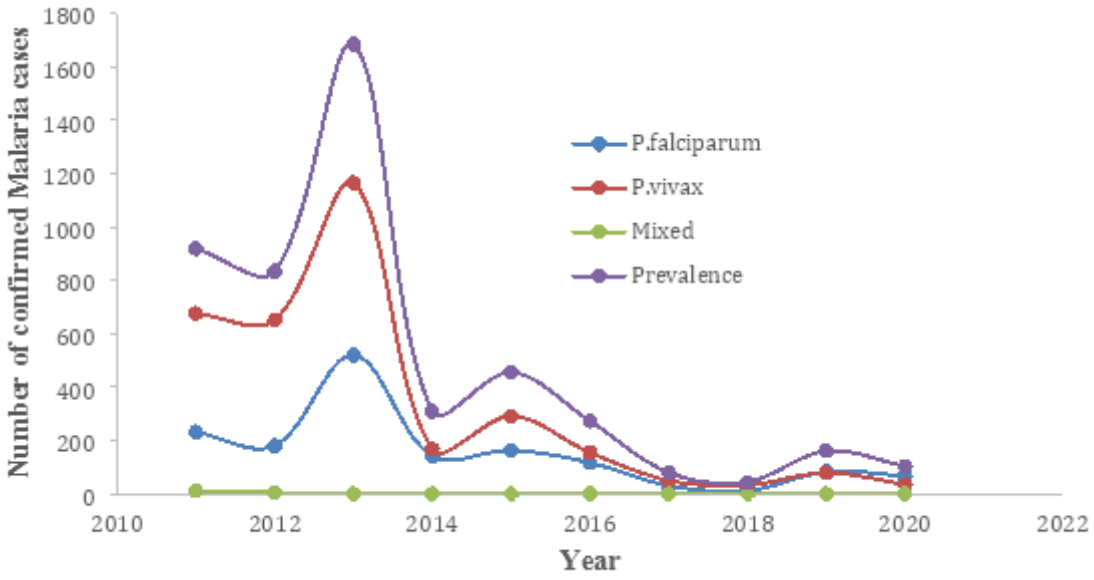

Figure 2

Trend of Malaria from 2011 to 2020 in Ziway Dugda district, Ethiopia

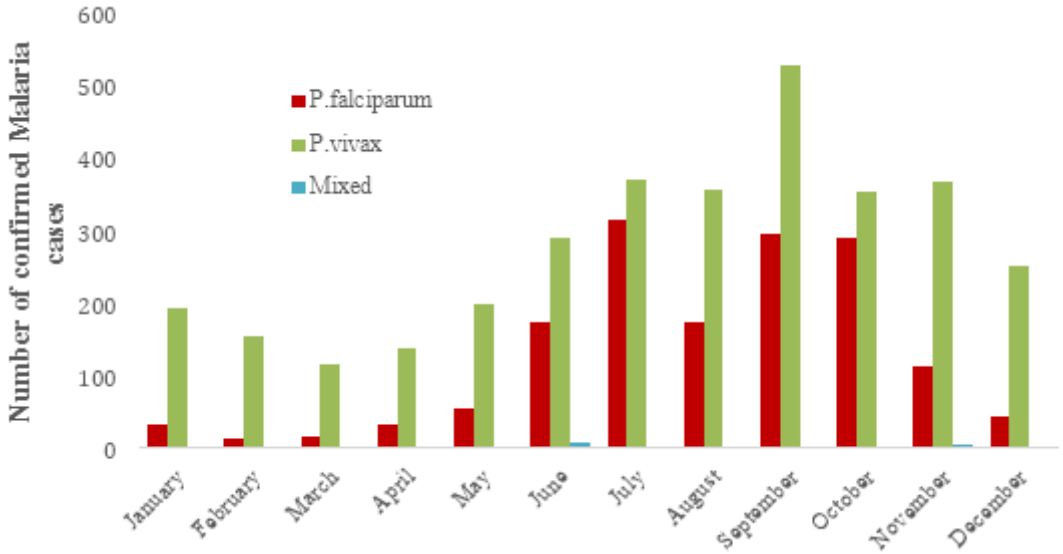

Figure 3

Distribution of Plasmodium in different months from 2011 to 2020 in Ziway Dugda district, Ethiopia

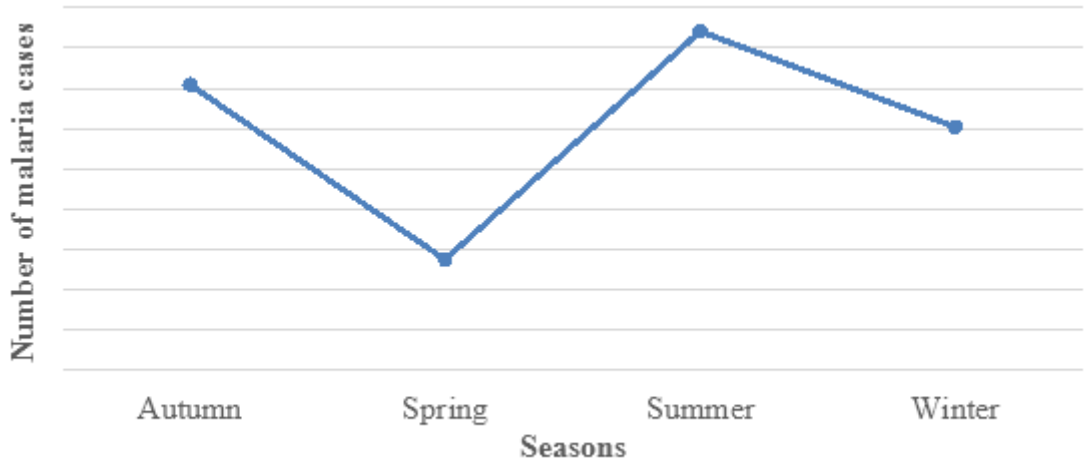

Figure 4

Trend of Malaria in different seasons of the year from 2011 to 2020 in Ziway Dugda district, Ethiopia