

A RETROSPECTIVE ANALYSIS OF MALARIA PREVALENCE FROM 2015 TO 2020 IN SIBU SIRE WOREDAS, EAST WOLLEGA ZONE, AND WESTERN ETHIOPIA

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ABSTRACT

Objective: The main objective of the study was to analysis the trends of malaria prevalence and surveillance data from 2015 to 2020 in Sibum Sire Woreda, East Wollega Zone, and Western Ethiopia.

Material and methods: A Retrospective study was conducted on purposely selected hospital and health centers of Sibum Sire Woreda, East Wollega zone zones September 2015 to August 2020.

Results: From the total 20,030 cases of malaria reported in Sibum Sire Woreda from 2015- 2020, 6,965 confirmed cases were reported, 2,234, 3,203 and 1,528 in Chingi health center, Sibum Sire health center and Sibum Sire Hospital, respectively. The high prevalence of malaria cases in the study are was reported both in autumn and spring seasons (April to September), and in relation to year distribution, more confirmed cases were reported during 2011 and 2012.

Conclusion: The study demonstrated that malaria is a public health concern, in which *P. falciparum* and *P. vivax* are the predominant species, so, it needs more interventions to interrupt disease transmission and eventual reduction malaria of malaria cases Sibum Sire Woreda.

Keywords: Ethiopia, Sibum Sire Woreda, Malaria Prevalence, Retrospective study

1. INTRODUCTION

Due to the improved coverage of malaria treatments and intervention measures have been expanded throughout the world, in Ethiopia prevalence of malaria cases have been decreased in the past two decades (1). In contrast, but still large numbers of the population are suffering and now days large number of death has been reported in

Ethiopian (2). For instants, in 2016, about 2,927,266 new malaria cases and 4782 deaths were reported, respectively. Furthermore, more than 30% of the disabilities cases were reported and still the malaria cases results a huge social and economic development (3).

Generally, malaria cases is more critical issue for the rural communities of the country than urban area since the malaria prevention and control strategy is highly depends on the availability of some infrastructure. This idea is supported by the research conducted Temesgen et al.,2019, the authors reported that some economic issues such as having good and well sanitized housing and drainage system and well appropriate expanded personal protection can effective the diagnostic and treatment of malaria cases (17). So, many sub-Saharan countries including Ethiopia are more affected by malaria cases than any other parts of the world since they are characterized by poor housing, lack of sanitation and drainage of surface water that would provide favorable conditions for malaria vector breeding (5).

As the research conducted Desalegn Dabaro (2020), reported that more than 60% of the population has been suffered due to malaria cases. The same authors indicated that the prevalence of malaria rich the highest peak in 2018 with the mouths of transmission from September to December, following the main rainy seasons (June to September). In spite of the widespread incidence of malaria in several districts of the region, the general trend of malaria prevalence has not been thoroughly studied in sibu sire woreda particularly in this respective year. Therefore, this study aimed to assess the trends of prevalence and surveillance data of the consecutive six years from 2012- 2017.

2. METHODS

2.1. Study Area and Period

The study was conducted in Sibu Sire district, East Wollega Zone of Oromia

Regional State, based on the clinical data report from 2007 to August 2012. It is one of the districts in east Wollega Zone and is located 281Km in West from Addis Ababa and 50 km East from Nekemte, the administration town of East Wollega Zone. Sibu Sire has 22 kebeles from these 19 kebeles are rural and 3 municipals. The study area has a total population of 124,304 and from these urban dwellers male 6744 and female 6954, rural dwellers male 54,920 female 55,686 (8).

2.2. Study Design and Population

A retrospective study was conducted to determine the prevalence of malaria over six years (from September 2015 – August 2020) in east wollega zone, sibu sire district. In this study the malaria prevalence and surveillance data from district health services (Sibu Sire Hospital, Chingi health center, and Sibu Sire Health center) was employed to determine the six years analysis of malaria prevalence by reviewing blood film malaria record from Sibu sire hospital and health center and also chingi healthcenter. The study participants were all individuals diagnosed for malaria using giemsa stained preparation and the data registered on laboratory registration book during the study period (from September 2015 to August 2020) . While data collections information such as date of examination, numbers of treated and confirmed cases of malaria in months and years, respectively, malaria species, and patients data (age and sex) were collected.

2.3. Data collection

A6 years (2015–2020) retrospective data on malaria prevalence was collected from September 2015 to August 2020 at Sibu Sire Hospital, Chingi health center, and Sibu Sire

Health center. In this health centers, peripheral smear examination of blood film has been used as the gold standard in confirming the presence of malaria infection.

2.4. Data quality control

In this study, the six years data concerning malaria prevalence was taken from malaria registration book in sibu sire health centers. To collect the data in good manner, the data collection format sheet was prepared and has been used for recording the data. All data collectors were adequately trained about the data collection procedures. Overall data process and analysis was conducted by principal investigators. Always the researchers checked the number of confirmed cases with the number of suspected cases throughout the reviewed data.

2.5. Data Analysis

Data analysis was conducted using Microsoft Excel data sheets, and analyzed using SPSS 21 software package. Distribution and prevalence of malaria species in terms of sex, age was analysis using figure, tables and charts. Furthermore, the trend of malaria case in terms of age, sex, years and months was determined.

3. RESULTS

3.1. Trend of malaria cases in Sibu Sire Woreda from 2015 to 2020

During the study duration conducted from 2015 -2020, a total of 20,030 patients were diagnosed for malaria cases and examined. Out of these, 6,965(69.54%) were reported as a positive cases. The prevalence of malaria was fluctuating during the six years of study with minimum (n=240) and maximum (n = 690) number of annual cases were reported (Table 1). The highest numbers of malaria-suspected patients were examined in 2019 and, 2020, respectively.

Table 1: Distribution of malaria cases in relation to sex and age groups; Sibu Sire districts (Sibu Sire health center, Chingi health center, and Sibu Sire Hospital), from 2015 to 2020.

Sex	Age groups	Positive (%)	Negative (%)	Positive (%)	Negative (%)	Positive (%)	Negative (%)
Male	<5	198(23.00)	694(78.00)	394(27.00)	1086(74.00)	173(34.60)	327(65.40)
	5 to 15	242(34.22)	465(66.00)	560(31.00)	1295(70.00)	243(32.00)	517(68.02)
	>15	704(41.25)	1003(58.80)	800(40.00)	1700(60.00)	420(38.60)	667(62.00)
Female	<5	190(24.00)	610(76.20)	301(27.00)	815(73.02)	100(21.00)	373(79.00)
	5 to 15	200(28.60)	500(71.42)	447(44.00)	583(56.60)	203(31.40)	444(69.00)
	>15	700(46.20)	817(54.00)	701(37.00)	1204(63.20)	100(26.00)	289(74.20)
Total	<5	388(23.00)	1304(77.01)	695(27.00)	1901(73.00)	273(28.00)	700(72.00)
	5 to 15	442(31.42)	965(68.60)	1007(35.00)	1878(65.00)	446(35.40)	814(64.60)
	>15	1404(44.00)	1820(56.45)	1501(39.00)	2405(61.60)	809(38.80)	1278(62.00)

3.2. Prevalence of Malaria Cases among sex and age in Sibiu Sire Health Centers from 2015 to 2020.

Regarding the prevalence of malaria among sex, there was no significance difference distribution, but in terms of age, the high distribution of malaria was observed in age category greater than 15 years old. Age groups ≥ 15 years were more affected, with a prevalence rate of 3,714 (18.54%), followed by 5-15 years old, and under 5 years' children with prevalence rates of 1,356 (7%), respectively (Table 1).

3.3. Prevalence of malaria in terms of seasonal variation months of two Health Centers and Sibiu Sire Hospital (2015-2020).

According to this finding the seasonal distribution of malaria cases is presented in Fig. 4. Hence, although the prevalence of malaria has been occurred in all seasons, but the prevalence of malaria cases was fluctuating across the four seasons over the last 6 years (2015-2020). The highest and the lowest cases of malaria were observed during spring (September, November) (38.19%) and winter (December – February) (10.00%), respectively. Higher number of cases of *P. falciparum* was pragmatic in spring and summer, while more cases of *P. vivax* were observed in spring, followed by winter. However, the minimum number of *P. falciparum* and *P. vivax* cases were observed during winter (December – February).

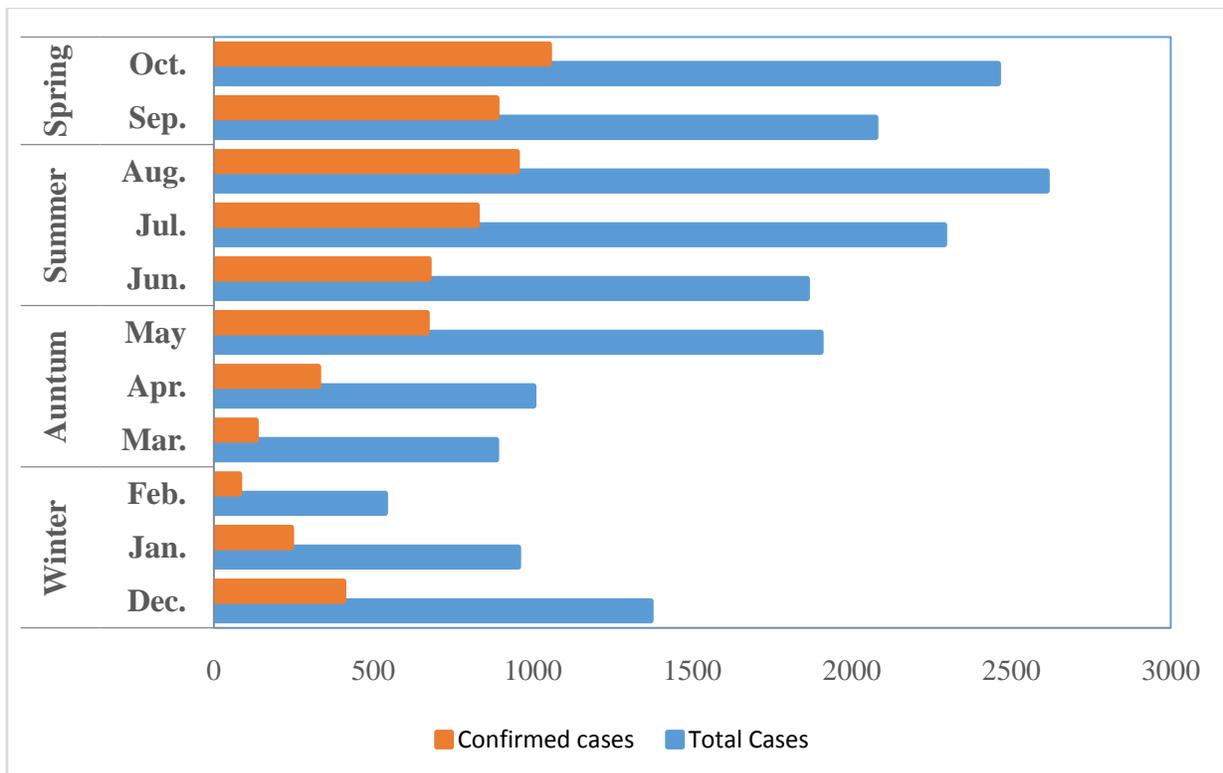


Figure 1. Prevalence of malaria in terms of seasonal variation months of two Health Centers and Sibiu Sire Hospital (2015-2020)

3.4. Prevalence of Malaria species

The prevalence of confirmed malaria cases was higher in Sire Health Center (28%) followed by Chingi Health Center (22%). The highest prevalence of *P. falciparum* also

was reported Sire Health Center. Similarly, higher rate of *P. vivax* infection was recorded Sire Health Center including the mixed infection of both malaria species.

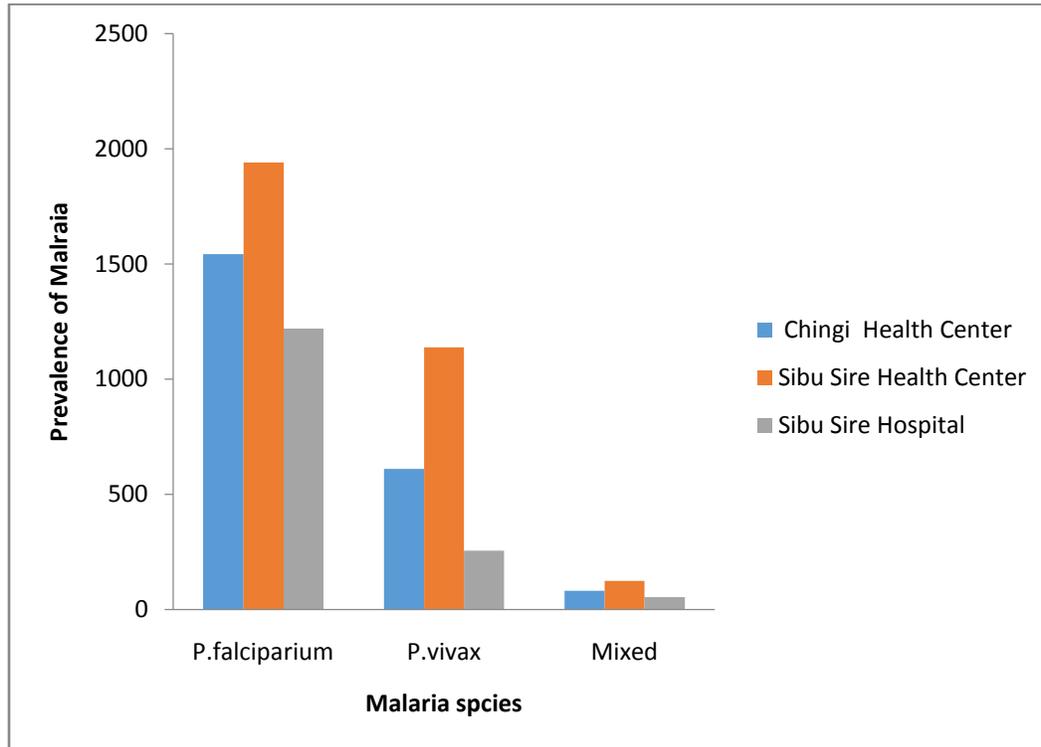


Figure 2. Prevalence of malaria species in sibu sire Woreda health centers from 2015-2020.

Table 2. Distribution of Malaria species among age categorize in Sibu Sire District Health facilities from 2015 to 2020, East Wollega Zone, Ethiopia.

Age	Malaria Species	Positive	Negative	Positive	Negative	Positive	Negative
<5	<i>P.falciparum</i>	203(12.00)	1489(88.00)	524(20.18)	2072(80.00)	268(27.54)	705(72.46)
	<i>P.vivax</i>	120(7.09)	1572(92.91)	318(12.25)	2278(88.00)	56(5.76)	917(94.24)
	Mixed	0.00	1692(100.00)	35(1.35)	2561(98.65)	12(1.23)	961(98.77)
5 to 15	<i>P.falciparum</i>	800(56.86)	607(43.14)	582(20.17)	2303(80.00)	353(28.03)	907(72.00)
	<i>P.vivax</i>	310(22.03)	1097(77.97)	325(11.27)	2560(88.74)	74(2.87)	1186((64.00)
	Mixed	64(4.55)	1343(95.45)	37(1.28)	2848(98.72)	16(1.27)	1244(99.00)
>15	<i>P.falciparum</i>	540(16.75)	2683(83.25)	776(19.87)	3130(80.13)	585(28.03)	1502(72.00)
	<i>P.vivax</i>	190(5.90)	3033(94.10)	466(11.93)	3440(88.07)	122(5.85)	1965(94.00)
	Mixed	17(0.53)	3206(99.47)	52(1.33)	3854(98.67)	26(1.25)	2061(99.00)

According to the this findings, concerning to the trends analysis of malaria species across the age groups revealed that, in all age and sex groups, the most predominate malaria species was *P. falciparum* followed by *P. vivax*. A sharp increment of cases in these two species was observed in the age groups 5-15 through >15 years. An increment in mixed infections was also seen in the age groups 5-15 years through >15 (Table 2)

3.5. Annual trends analysis of malaria cases in sibu sire districts health facilities, 2015 to 2020

Regarding to the trends analysis of malaria in sibu sire woreda from 2015 to 2020, fluctuating trends analysis was occurred and there was not definition of the prevalence as the overall the six years data showed that. It was observed to the highest prevalence rate of malaria were observed in 2017, 2019 and 2020, respectively. The highest peak was observed in 2019 and 2020, with the highest percentage of malaria cases (Figure 3).

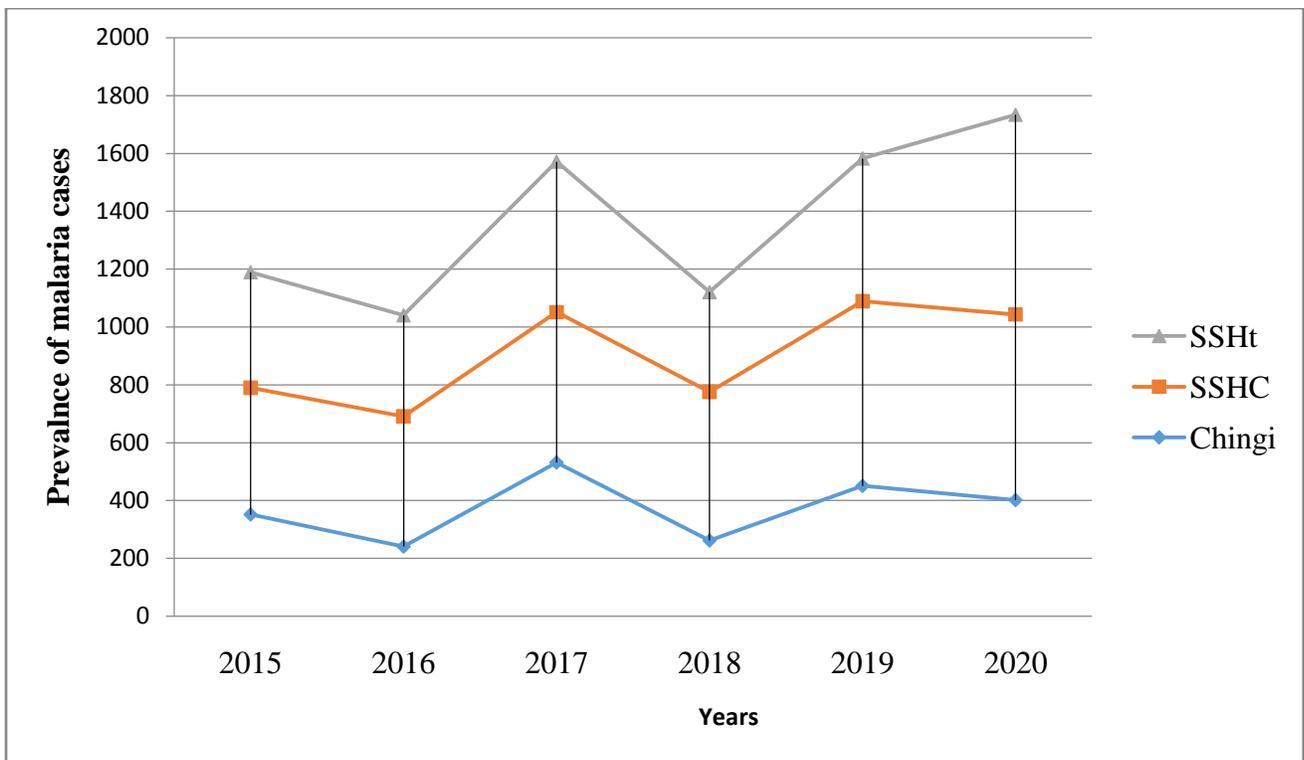


Figure 3. Annual trend of malaria prevalence at Sibiu Sire District, East Wollega Zone (2015–2020)

4. DISCUSSION

The present study was conducted to evaluate the trends of malaria prevalence in Sibiu Sire Woreda health centers from 2015 -2020 for consecutive six years. The overall six years malaria trends analysis of the three health

centers of sibu sire Woreda indicates that the incidence of the total confirmed cases of the malaria were still increased from 2015-2020. The overall prevalence of malaria in this study was 69.54% where a total of 6,966 confirmed malaria cases were detected in six

years from 2015-2020 years retrospective study, important indicator for existence of malaria burden in Sibu Sire Woreda Health center. The result of the present study is similar with the retrospective study conducted in Benishangul Gumuz Regional which reported that about 57.5% of the malaria cases were reported (9).

In this study in compared to other study as the trends of malaria revealed that, much higher prevalence of the malaria cases was reported and hence, this retrospective study is higher than the study conducted five-year trend study conducted in Ataye, North Shoa, Ethiopia; reported a total prevalence of 8.4%, the seven-year retrospective malaria report from Metema hospital, northwest Ethiopia; detected a prevalence of 17%, the fifteen-year study in Ethiopia; and noted a prevalence of 12.5% (10-11). The differences might be due to time variations of the studies, difference in insecticide application in the areas, variations in geographical locations, and differences in population awareness about malaria control methods application and utilizations, its transmission. Regarding to the annual prevalence of the malaria trends in this study, the highest prevalence was observed in 2019 followed by 2020.

In the current study, the prevalence of malaria was high in August and the least in March over the six years of twelve months. Seasonal fluctuations and high prevalence of malaria were observed in spring (September to December) and the least prevalence in autumn (March to May). This finding is more similar with the study conducted by Dabaro et al., the authors revealed that, high prevalence of malaria was reported from September to December and this issue may be related to some environmental conditions

such as presence of stagnant water, favorable temperature, and high vegetation density for mosquito breeding. On the other hand, the least prevalence was observed in spring (March to May); this might be due to drought (18).

The study also showed that the prevalence of malaria was high among sex was not shown significance variation, but on other hands the heights prevalence of malaria was observed among age category greater than 15 years old over the six years trend. The present finding was much more similar with the study conducted in Addi Arkay health center and Abeshge (12-13). The youngest age the so called productive age groups were most of the time more affected than the others, because they are more engaged in filed and as the result they are more exposed. In contrast, less than five years age categories were less exposed, because of their less likely exposure to infected mosquito bite, this may be due their parents care takers on malaria control and prevention activities.

In the study area, the number of malaria cases peaked in spring, followed by autumn. These two seasons are the major transmission periods in Ethiopia, respectively. In generally speaking as we cited and discussed repeatedly, the main transmission session of malaria cases were heavily seeks for the heavy rain seasons which is from June to September. Because, it is this period which creates suitable conditions for the breeding of Anopheles mosquitoes. In many cases the malaria transmission is usually associated with rainy seasons; in the present study malaria cases were also significant in winter and autumn, indicating that climatic and environmental factors other than rainfall can also determine the occurrence of malaria (19, 20).

Concerning to the prevalence of the malaria species of the current study sites, the two species (*Plasmodium falciparum*, *P. vivax*) were the dominant malaria species identified in the study area. This was in agreement with the national profile of *Plasmodium species* (1-4). According to the present findings declared that, the prevalence malaria cases (*Plasmodium species*) varied from year to year. There has been an increase in *P. falciparum* cases in recent years, particularly in 2018 and 2019, and a minor drop in *P. vivax* cases. Due to its clinical difficulties and drug-resistant danger, stakeholders have focused their efforts on combating *P. falciparum*. Other *Plasmodium species*, on the other hand, have received less attention. As a result, drug resistance to chloroquine in *P. vivax* may be developing.

CONCLUSION

In conclusion, the study found that malaria continues to be a public health concern in an area with a high proportion of slide positivity. This would be a strong indication that the area requires additional attention and coordinated malaria efforts. Despite the fact that modern malaria control measures are effective in reducing patient morbidity and mortality, malaria remains one of the most serious public health problems.

Statements

The authors have no conflict of interest
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Ethical issue, is not applicable for this study

Author's contributions

In this paper both authors have put their own finger print for the successful compliment of the paper. Hence, the first author has

participated on edition, data analysis and advising parts. While the second author has done activities like data collection, analysis and write up of the paper.

REFERENCES

1. FMOH. Proceedings of the annual review meeting, Malaria symposium and world malaria day, Hawassa, SNNPR, 2015.
2. FMOH . National malaria guideline. 3. Addis Ababa: FMOH; 2012.
3. Girum, T, Shumbej T, Shewangizaw M. (2019). Burden of malaria in Ethiopia, 2000-2016: ndings from the Global Health Estimates 2016. Trop Dis Travel Med Vac 2019; 5:11. RLEPOSSD (2013). Rural Land Environmental Protection of Sibu Sire District, East Wollega Zone Oromia, Ethiopia.
4. Wilson ML, Krogstad DJ, Arinaitwe E, Arevalo-Herrera M, Chery L, Ferreira MU, Ndiaye D, Mathanga DP, Eapen A. Urban malaria: understanding its epidemiology, ecology, and transmission across seven diverse ICEMR national sites. Am J Trop Med Hyg. 2015; 93:110–23.
5. De Silva PM, Marshall JM. Factors contributing to urban malaria transmission in sub-Saharan Africa: a systematic review. J Trop Med. 2012; 2012:819563.
6. Ministry of Health. Ethiopia National Malaria Indicator Survey 2015. Addis Ababa: Ethiopia Public Health Institute; 2016
7. Gemechu, Temesgen, Abdi Samuel, and Delensaw Yewhalaw. "Ten years trend analysis of malaria prevalence and its correlation with climatic variables in Sibu Sire District, east Wollega zone, Oromia regional state, Western Ethiopia: a retrospective study." Science, Technology and Arts Research Journal 4.4 (2015): 99-105

8. Yaregal G. Surveillance Data Analysis of Malaria in Benishangul Gumuz Region State/ western Ethiopia from 8 July 2014 to 7 July 2016 GC: Ethiopian Field Epidemiology Training Program, Addis Ababa University, Addis Ababa, Ethiopia, 2017
9. G. Ferede, A. Worku, A. Getaneh et al., "Prevalence of malaria from blood smears examination: a seven-year retrospective study from Metema hospital, Northwest Ethiopia," *Malaria Research and Treatment*, vol. 2013, Article ID 704730, 5 pages, 2013
10. Feleke D. G., D. Gebretsadik, and A. Gebreweld, "Analysis of the trend of malaria prevalence in Ataye, North Shoa, Ethiopia between 2013 and 2017," *Malaria Journal*, vol. 17, no. 1, p. 323, 2018.
11. Federal Democratic Republic of Ethiopia Ministry of Health. National Malaria Elimination Roadmap. Addis Ababa: Federal Democratic Republic of Ethiopia Ministry of Health; 2016. pp. 1–32.
12. Agegnehu F., A. Shimeka, F. Berihun, and M. Tamir, "Determinants of malaria infection in Dembia district, Northwest Ethiopia: a case-control study," *BMC Public Health*, vol. 18, no. 1, p. 480, 2018.
13. Ferede, D. G., A. Worku, A. Getaneh et al., "Prevalence of malaria from blood smears examination: a seven-year retrospective study from Metema hospital, Northwest Ethiopia," *Malaria Research and Treatment*, vol. 2013, Article ID 704730, 5 pages, 2013.
14. File, Temesgen, Hunduma Dinka, and Lemu Golassa. "A retrospective analysis on the transmission of Plasmodium falciparum and Plasmodium vivax: the case of Adama City, East Shoa Zone, Oromia, Ethiopia." *Malaria journal* 18.1 (2019): 1-5.
15. Tesfa, Habtie, Abebe Genetu Bayih, and Ayalew Jejaw Zeleke. "A 17-year trend analysis of malaria at Adi Arkay, north Gondar zone, Northwest Ethiopia." *Malaria Journal* 17.1 (2018): 1-6.
16. Feleke, Daniel Getacher, Daniel Gebretsadik, and Angesom Gebreweld. "Analysis of the trend of malaria prevalence in Ataye, North Shoa, Ethiopia between 2013 and 2017." *Malaria journal* 17.1 (2018): 1-6.

List of abbreviation

SPSS Statistical Package for the Social Sciences
 MoH Ministry of Health
 FDRE Federal Democratic Republic Of Ethiopia
 FMOH Federal Ministry of Health