Institute of Health, Department of Epidemiology

Determinants of Malaria Infection among Residents of Kakie Town, West Ethiopia: Facility Based Unmatched Case Control Study

By: Tariku Lema (BSc.)

A Research Thesis Submitted to Department of Epidemiology, Institute of Health, Jimma University, In Partial Fulfilment of the Requirement for Masters' Degree in Field Epidemiology

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Abstract

Background: Globally malaria remains one of the most severe public health problems resulting in massive morbidity particularly in developing countries. Ethiopia as one of the sub-Saharan country is highly endemic to malaria. It was noted that early detection and prompt treatment of malaria cases, selective vector control and epidemic prevention and control are the major strategies for malaria prevention and control.

O**bjective**: This study assessed determinants of malaria infection among residents of Kakie town, Kellem Wollega, 2019.

Methods: Facility based unmatched case control study design was used to assess determinants of malaria from March 01 to April 30, 2019. A total of 238 cases and controls (119 each) were included in the study. Cases were patients who visited Kakie health center and Kakie hospital and had malaria confirmed by microscopy and the controls were patients who visited the same health facility with any type of medical cases and had no any sign and symptoms malaria and lived in the same Kebele. Data were collected by using pretested structured questionnaire. The collected data was entered into Epi data version 3.1 and exported to SPSS version 21 for analysis. Bivariate analysis was made to identify candidate variables. Multivariate analysis was made to identify independently significant variable. P-Value <0.05 was used to report significance and AOR with 95%CI for strength of association.

Result: The response rate was 100% in both cases and controls with mean age of 30.13±12.416SD and 29.44±10.941SD years respectively. The sex of the study participants was almost similar among cases and controls with male sex being 44.5% in cases and 45.4%) in controls respectively. In the multivariable logistic regression, presence of holes in the walls of house [AOR=4.87, P.value= 0.029, 95%CI 1.17-20.25], regular sleeping under ITN [AOR=0.297, P.value=0.002, 95%CI 0.136- 0.65] and staying outside beyond 3.o'clock local time at night hours [AOR=3.4, P.value=0.006, 95%CI 1.42- 8.14] were found to have significant association with malaria infection.

Conclusion: The chance of acquiring malaria infection is less likely in those who sleep under ITN regularly whereas those who live in houses with holes and who stays outside at night beyond 3 o'clock were more at risk of malaria infection than their counterparts. Dale Wabera Woreda health office, and health workers in Kakie health center and Kakie primary hospital should give health education on the identified risk factors.

Key words: Malaria, Determinants, Case-control study, Ethiopia

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Acronyms

AOR	Adjusted Odds Ratio
BSc	Bachelor of Science
CDC	Center of Disease Control
CI	Confidence Interval
DALY	Disability Adjusted Life Year
GDP	Gross Domestic Product
GTS	Global Technical Strategy
HH	House Hold
HC	Health Center
IRS	Indoor Residual Spray
ITN	Insect side Treated bed Net
MPH	Masters of Public Health
OR	Odds Ratio
ORHB	Oromia Regional Health Bureau
P.F	Plasmodium Falciparum
P.M	Plasmodium Malariae
P.O	Plasmodium Ovale
P.V	Plasmodium Vivax
SD	Standard Deviation
USD	United State Dollar
WorHo	Woreda Health Office
WHO	World Health Organization

Chapter one: Introduction

1.1. Background

Malaria is caused by infection of red blood cells with protozoan parasites of the genus Plasmodium. The parasites are inoculated into the human host by a feeding female anopheles mosquito. The four Plasmodium species that infect humans are P. falciparum, P. Vivax, P. ovale *and* P. malariae. P. falciparum and P. Vivax malaria pose the greatest public health challenge. P. falciparum is most prevalent on the African continent, and is responsible for most deaths from malaria(1,2).

The nature of malaria clinical disease depends greatly on the background level of the acquired protective immunity, a factor which is the outcome of the pattern and intensity of malaria transmission in the area of residence(1).

The risk of infection is determined by the number and species of mosquitoes present in a given area as well as the climate and geography. In many parts of the world transmission of malaria coincides with the rainy season when mosquitoes thrive to breed and there is increased agricultural activity. Population shifts caused by political unrest, climatic events and environmental changes brought on by urbanization, deforestation and forced irrigation have all contributed to the increased incidence of malaria(3).

According to the WHO (2015) statistics, there were 214 million reported malaria cases (lower than WHO report of 2018 which is 219 million) with 438*;* 000 deaths of which the African region accounting for 88%. About 313 million people in the 12 countries of the East African region are at some risk for malaria, with 254 million at high risk(2,4).

The transmission of malaria is unstable and seasonal from September to December and April to May which is coincide with major planting and harvesting season for farmers - aggravate economic loss(5). The distribution and transmission of malaria in Ethiopia varies from place to place. For example, the distribution of malaria in Ethiopia is largely determined by altitude. Altitude affects the pattern of malaria distribution in Ethiopia through its effect on temperature. Risk of malaria is highest in the western lowlands of Oromia,Amhara and Tigray and almost the entire regions of Gambella and Benishangul Gumuz regions(5).

In Ethiopia, malaria is highly seasonal in many communities, but may have nearly constant transmission in some other areas; at the district level, malaria outpatient

caseloads may vary several-fold from year to year in an “unstable” epidemic-prone transmission pattern. Peak malaria transmission occurs between September and December in most parts of Ethiopia, after the main rainy season from June to August(6,7).

Since 2005, Ethiopia has scaled up malaria control programs using key malaria interventions such as effective case management (artemisinin combination therapy and malaria rapid diagnostic tests), and vector control options (indoor residual spray and long-lasting insecticidal nets) in endemic areas (<2,000 m). Subsequently, the program obtained fruitful results in reducing malaria burden between 2006 and 2008. In addition, the 2011– 2015 National Strategic Plan highlights the intent to eliminate malaria in specific geographical areas with historically low malaria transmission; and achieve near zero malaria deaths in the remaining malarious areas of the country(8).

Malaria is prevalent in Dale Wabera Woreda and it was important to identify risk factors associated with high malaria burden.

1.2. Statement of the problem

Malaria is one of the most serious diseases to affect people in developing countries with tropical and subtropical climates. Malaria is endemic in 109 countries and more than three billion of the world's population lives in malaria risk regions. Globally, 350–500 million episodes of malaria illness occur each year, resulting in over one million deaths. More than 90% of the worldwide deaths from malaria occur in sub-Saharan Africa(9).

Although malaria case incidence has fallen globally since 2010, the rate of decline has stalled and even reversed in some regions since 2014. Mortality rates have followed a similar pattern. The WHO African Region continues to account for about 90% of malaria cases and deaths worldwide. Fifteen countries – all but one in sub-Saharan Africa – carry 80% of the global malaria burden(10,11).

Despite considerable investment in the fight against malaria since 2000, ensuring sufficient, sustained and predictable funding to achieve the Global Technical Strategy (GTS) milestones and targets remains one of the biggest challenges. In 2017, an estimated US$ 3.1 billion was invested in malaria control and elimination efforts globally by governments of malaria endemic countries and international partners. In 24 out of 41 high-burden countries, which rely mainly on external funding for malaria programmes, the average level of funding available per person at risk declined in 2015–2017 compared to 2012–2014(2).

The human suffering and loss of life caused by malaria is often matched by the economic burden placed on families who bear the direct costs from their own pockets. Personal expenditure includes spending on insecticide-treated nets, doctors' fees, anti-malaria drugs, transport to health facilities, support to the patient and funeral costs. This can put an unbearable strain on household resources. In Ghana malaria care can cost up to 34 percent of a poor household's income(12).

In addition to its impact on health of all age groups, malaria is also affecting economy of African countries. It already costs the continent's economy US$ 12 billion per year in direct losses, and 1.3% of lost annual GDP growth(13).

Study conducted in four provinces of Kenya shows that the mean days affected due to malaria infection were 7 .2, 5.4, 4.0 for income days for ill adults, for care givers and school days affected respectively(14).

Though its prevalence in Ethiopia is relatively low compared to other African nations, malaria remains the leading cause of outpatient morbidity and is among the leading causes

of inpatient morbidity. Nearly 60 percent of the population lives in areas at risk of malaria, generally at elevations below 2,000 meters above sea level and 68% were at risk of malaria in 2016(15).

Study conducted in south central Ethiopia on economic burden of malaria shows over all median cost of malaria per episode to the House Holds (HH) being 5.06USD and mean total cost of 6.1USD(16).

There are many different risk factors for malaria infection. Studies conducted in different areas including Ethiopia shows that malaria infection is affected by determinants like age of the patient, educational status of the patient, ITN utilization, IRS, travel history to malaria endemic area and housing conditions(17–19).

The ministry of health of Ethiopia have attempted different strategies for malaria prevention and control. Those strategies run by government of Ethiopia were indoor residual spray, early diagnosis and treatment and ITN utilization, most which supported by funding agencies. Even though ministry of health of Ethiopia is implementing these strategies to achieve the goals set for 2020(7,20), there are still high malaria cases in some parts of Oromia including the study area.

Although a number of studies have shown the prevalence of, and factors associated with malaria infection in Ethiopia, there is limited information about its determining factors in the study area.

As it is seen from different literatures discussed above, malaria has huge health and economic impact. So, to reduce these impacts early identification of malaria risk factors was mandatory.

1.3. Significance of the study

Assessments of malaria infection risk factors have paramount importance in providing strategic information for service improvement. Since the national strategic plan is to reduce malaria incidence, identifying malaria risk factors in areas with high malaria transmission is very important to achieve these strategies. It is helpful to achieve a goal set by WHO to reduce malaria infection by >40% globally by 2020.

It is useful for the communities to reduce impact imposed by malaria. It is also useful for the patients, Woreda health office, ORHB and different stake holders to act on solutions based on identified risk factors.

Chapter Two: Literature review

2.1. Overview

Although the implementation of core interventions expanded greatly between 2000 and 2014, the gains achieved are fragile and unevenly distributed. The human toll of malaria, and the global risk it still poses, remains unacceptably high. Efforts to prevent and control malaria contribute to and benefit from sustainable development. The objectives of reducing the disease burden and eliminating malaria are closely linked to several of the sustainable development goals being considered for the post-2015 period(21).

WHO developed global strategy for malaria which starts from 2016 and ends in 2030. This strategy consists of different goals like Reducing malaria mortality rates globally by >40% in 2020 compared with that of 2015, Reducing malaria case incidence globally by >40% in 2020 compared with that of 2015, Eliminating malaria from countries in which malaria was transmitted in 2015 by at least 10 countries in 2020 and Prevent reestablishment of malaria in all countries that malaria free by 2020(22).

Currently, a range of effective malaria control interventions are being scaled up in Ethiopia to improve access and equity to preventive as well as curative health services. These initiatives include prompt and effective treatment of malaria, selective vector control including insecticide treated nets and indoor residual spraying, and prevention and control of epidemics. Even though these strategies are set there are many risk factors which contributes to malaria prevalence in Ethiopia(23).

2.2. Malaria Risk Factors

2.2.1. Socio demographic factors

Age, educational status and sex are among the most common socio-demographic characteristics of a patient that can predict malaria infection.

A number of studies conducted in different parts of Africa shows that malaria infection is associated with age. Study conducted in Equatorial Guinea and Butajira area shows malaria is common among children less than five years old(8,24). Another study conducted in East shoa shows malaria infection is common among age group of 16-44 years compared with older ones(17).

Different studies conducted in different parts of the continents state idea about gender relation with malaria morbidity. For example study conducted in Dambia district of Amhara region indicates that those who are male are 2.2 times more likely to get malaria than females(25).

Education level of individual is one of the major determinants of malaria infection. Studies conducted in different parts of Africa proves that malaria infection is associated with educational level of an individual. According to study conducted in urban and peri urban area of Blantyre (Malawi) high level of education is protective against malaria infection(26).

There are also supportive studies conducted in Nigeria and northern Ethiopia which shows low level of education is risk factor for malaria morbidity(27–29).

Few studies were conducted on effect of family size on contracting malaria. Accordingly studies conducted in Dilla town and South Ethiopia shows that family size has not a risk factors for malaria infection and this still needs further study(30,31).

2.2.2 .Malaria prevention method related factors

Insecticide Treated bed Net (ITN)

Use of Insecticide-Treated Nets (ITNs) decreases malaria-related morbidity and mortality, especially in vulnerable groups such as children under age 5 and pregnant women. ITNs provide protection both to the individuals sleeping under them by deterring mosquito bites and to other community members by killing mosquitoes, thereby reducing transmission of malaria parasites(32).

Different study shows that using ITN is associated with reduced malaria infection. For instance study conducted in Gambia (AOR: 0.55, P=0.02) shows using ITN is associated with reduced odds of malaria(33).

Study conducted in Myanmar on Investigation and control of a Plasmodium falciparum malaria outbreak in Shan Special Region II of Myanmar along the China-Myanmar Border from June to December 2014; shows lack of bed net(OR 3.21,$p<0.05$) were associated with malaria infection during the outbreak(34).

Another study in Nigeria on pregnant women indicates use of ITNs was significantly associated with malaria prevalence and parasite density, as the number of participants who did not use ITNs regularly reported a high occurrence of malaria infection with a high parasite density, as compared to those who used ITNs on a daily basis ($p = 0.000$)(27). The use of LLINs was protective against malaria (odds ratio [OR] = 0.12; 95% CI = 0.03–0.42; P = 0.001) according to case control study conducted in Senegal during 2013(19).

Indoor Residual spray

Indoor residual spray is one of malaria transmission control strategy being implemented by Ethiopia funded by Presidents Malaria Initiatives (PMI).According to study conducted in Indonesia on Dominant risk factors for malaria , use of mosquito repellent is related with malaria prevention(35). A cross sectional study conducted on Malaria Prevalence and Its Associated Risk Factors among Patients Attending Chichu and Wonago Health Centres, of South Ethiopia showed that participants whose house had been sprayed with insecticide in the past 6 months were three times less likely to get malaria infection (OR = 0.33, 95% CI: 0.11, 0.92)(31).

2.2.3. Personal Activity Related Factors

Different human activities can contribute to malaria transmission in different parts. Accordingly study conducted in Zimbabwe on the investigation of malaria outbreak shows outdoor activities in the evening is 1.5 times for malaria infection than those who do not have no outdoor activities in the evening. Another study in malaria endemic village of Senegal indicates staying outside at night for a few hours was a malaria risk factor (AOR = 8.83; 95% CI = 1.39–56.22; P = 0.024)(19).

In addition to outside activities at night, travel history to malaria endemic area is associated with malaria infection. A cross section study conducted in Hadiya Zone shows individuals with a history of travelling to malaria endemic area were 2.59 times more likely to be malaria positive when compared to those who did not [AOR: 2.59, 95% CI: (1.24, 5.38)](36). It is also stated in study conducted in Tigrai that travel history has more risk than non-travellers(28).

2.2.4. Housing Condition and Environmental Related Factors

A case control study conducted on malaria outbreak investigation in Zimbabwe malaria outbreak is associated with housing condition. In this study those who lives in house with open eaves are 2.4 times more likely to get malaria infection than those without open eaves(18). Another study conducted in the southern part of Ethiopia shows the chance of getting malaria infection was significantly higher when the wall of the house was mud blocks/bricks, house floor was local dung and when living in stick and mud roofs. As study conducted in Dembia district and south Ethiopia shows presence of stagnant water near the living home is risk factor for malaria transmission(25,31).

Even though many determinants of malaria infection (ITN utilization, IRS, Travel history, age) were investigated in different parts of the country, still there is few studies conducted

on risk factors of malaria, especially risk factors like gender and housing conditions needs further studies especially in study area(30,31).

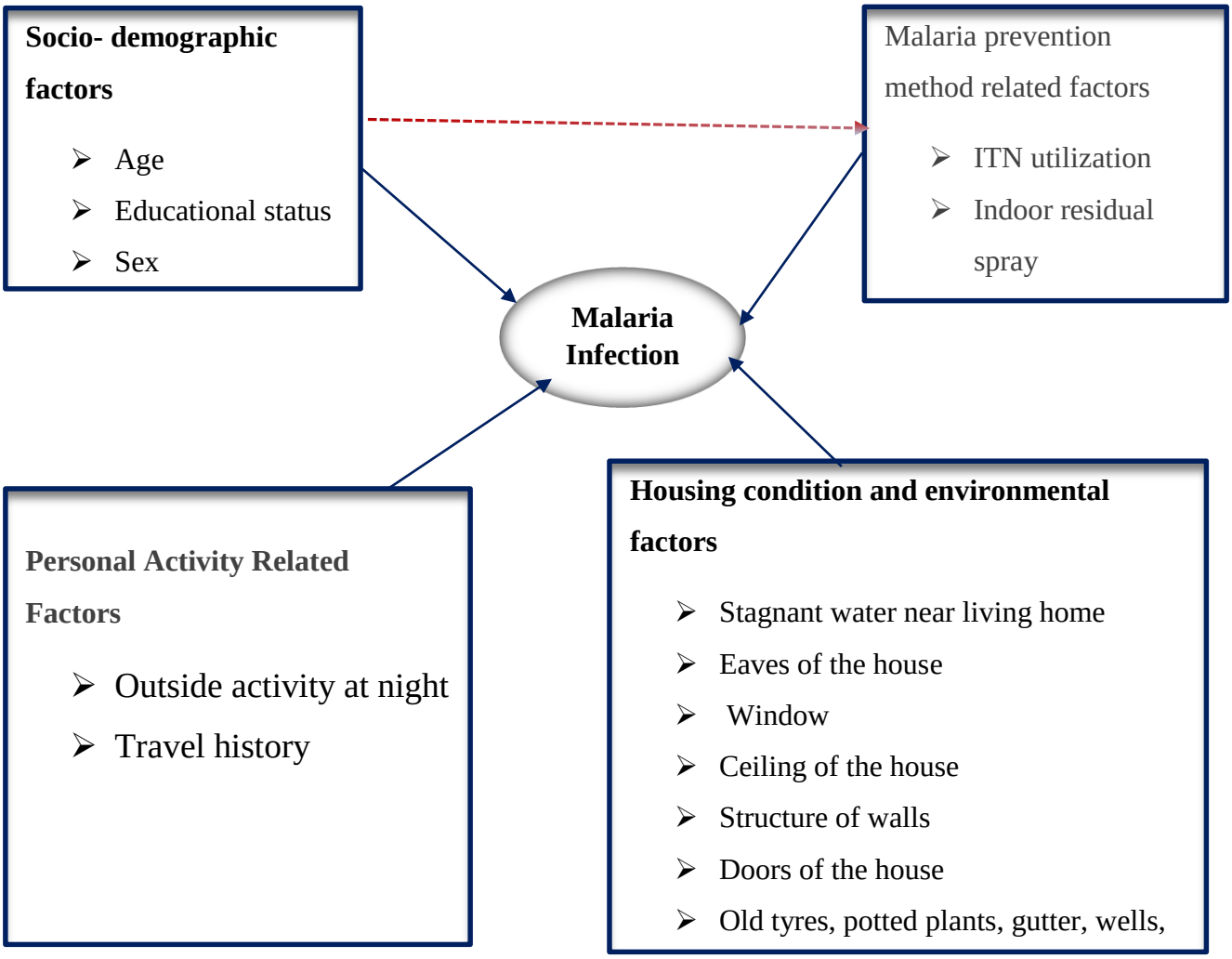

Figure 1: Conceptual framework developed after review of different literature for determinants of malaria infection, 2019 (34,37,38).

Chapter Three: Objectives

- To assess determinants of malaria infection among residents of Kakie town, Kellem Wollega zone, Ethiopia, 2019

Chapter Four: Methods and materials

4.1. Study area and period

The study was conducted in Kakie town (administrative town of Dale Wabera Woreda) found in Kellem Wollega Zone, Oromia Regional State. The town is 72 km far from Dembi Dollo and 595km from Addis Ababa to the west part of the country. It is at 1641m above sea level. The town has kebeles named as 01 and 02 Kebele. Based on the 2007census projection, the Woreda had a total population of 85,673, of whom 41,501 were men and 13,583 were less than fifteen years old. Of the total population in the Woreda, 22,531 lives in kakie town. The town has one HC and one primary hospital. The residents of Kakie town get services from Kakie HC and kakie primary hospital. The study was conducted from March 01-April 30 2019.

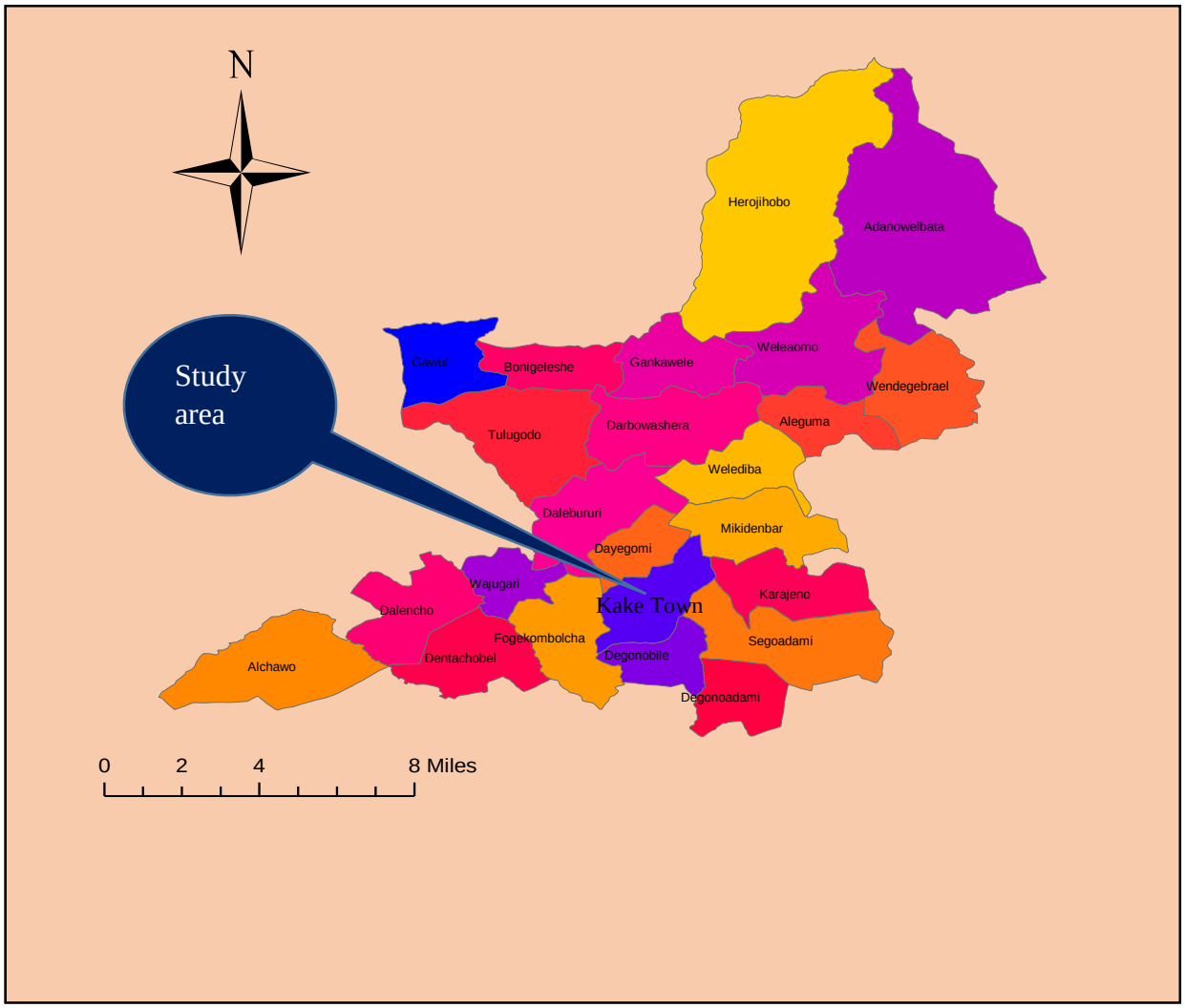

Figure 2: Map of Dale Wabera woreda and study area (Kakie town), April, 2019

4.2. Study Design

Facility Based unmatched case control study design was used.

4.3. Source Population

All residents of Kakie town who visited the two health facilities were considered as source population.

4.4. Study Population

4.4.1. Cases: Residents of Kakie town who visited both kakie health center and kakie primary hospital and diagnosed microscopically as having malaria infection during the study period.

4.4.2. Controls: Were individuals who came the same health facility with any type of medical cases and had no sign and symptoms malaria and lived in the same study area with the case during the study period.

4.5. Inclusion and Exclusion criteria

4.5.1. Inclusion criteria for cases

Residents of kakie town who visited kakie health center and kakie primary hospital and diagnosed with malaria microscopically during the study period.

4.5.2. Inclusion criteria for controls

- Residents of kakie town who visited either of the health facilities and had no sign and symptoms of malaria.

4.5.3. Exclusion criteria for cases and controls

Cases

- Residents of kakie town diagnosed with malaria clinically
- Those unable to provide the required information due to different conditions, like extreme illness (complicated malaria).

Controls

- Residents of kakie town who took antimalarial drugs from private clinic before data collection time.

4.6. Sample size determination and Sampling technique

4.6.1. Sample size determination

The sample size was calculated by using Epi info version 7.2.2.6 Stat Calc. from study conducted in southern Ethiopia, of determinant factors for malaria infection; Bed net utilization, Insect side spray, main material of wall being mud, main roof the roof being thatch were considered to obtain the maximum sample size (31). Finally insect side spray gave high sample size which is 238 (Table 1).

Table 1: Determinant variables used for determination of sample size using Epi info version 7.2.2 software with the parameters used and the total sample size, 2019

s.n	Determinant factors selected	%controls exposed	Case control	AOR	pow er	CI	Sample size		
							Case	Control	Tota
1.	Bed net utilization	16.3	1:1	0.19	80	95%	101	101	202
2.	Insect side spray	90.9	1:1	0.33	80	95%	119	119	238
3.	Main wall mud	39.5	1:1	6.57	80	95%	26	26	52
4.	Main roof thatch	36.5	1:1	6.33	80	95%	26	26	52

4.6.2. Sampling Technique

The sample size was proportionally allocated to both health facilities based on malaria cases diagnosed in one month. Approximately 40 malaria cases and 52 cases were diagnosed monthly from kakie health center and kakie hospital respectively. Accordingly, 67 cases and 67 controls were from Kakie hospital and the remaining 52 cases and 52 controls were from kakie health Center. All residents of kakie town who visited kakie HC and Kakie primary hospital and fulfils inclusion criteria for cases were interviewed using consecutive sampling technique. Controls were selected from individuals who came from the same study area as a case to the health facilities based on their arrival to the health facilities (those who came immediately next to the case and fulfils inclusion criteria were interviewed). The interview was made after the patient receives his/her treatment.

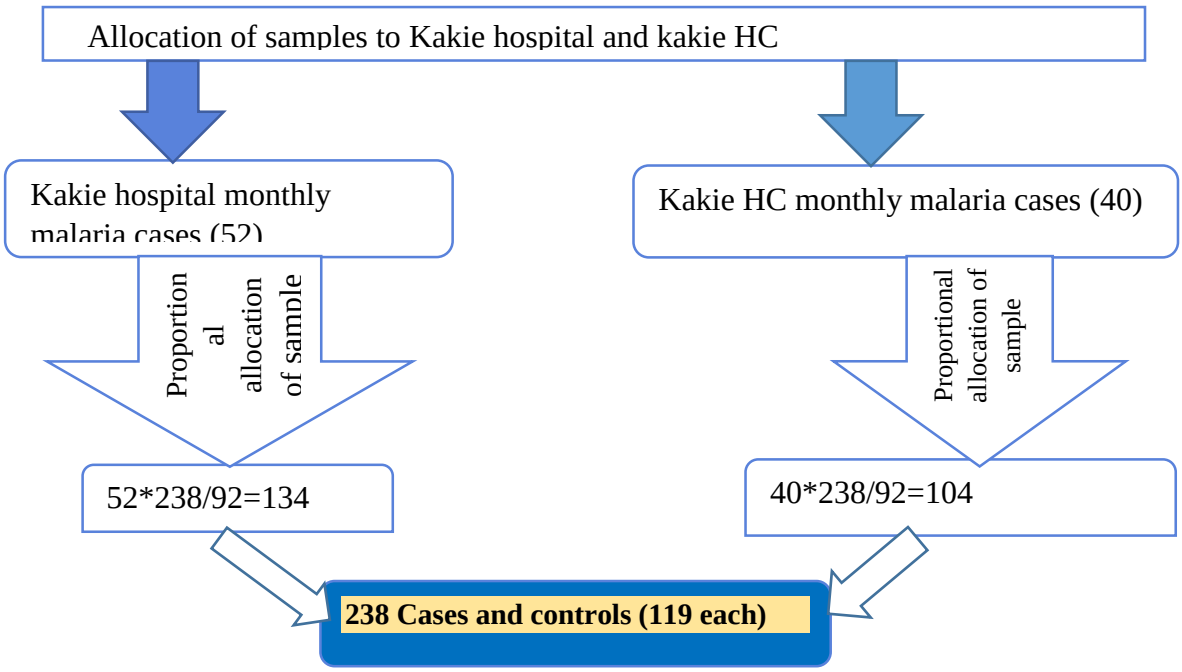

Figure 3: Sample size allocation for Kakie health center and Kakie primary hospital, 2019

4.7. Variables

4.7.1. Dependent Variable

- Malaria Infection

4.7.2. Independent Variables

- Socio demographic factors:
  - Age, sex, family size, educational status
- Malaria prevention method related factors:
  - ITN utilization, IRS
- Housing condition and environmental factors:
  - Structure of the house(walls, eaves, openings, cracks in the walls, ceiling, windows) , Presence of stagnant water, deep open wells, potted plants, old tyres,
- Personal activity related factors:
  - Staying outside home at night, travel history to malaria endemic area

4.8. Operational Definitions

- **Residents:** They were individuals who lived in the kakie town at least for the duration of six month.
- **Malaria infection:** Patients diagnosed as having any type of plasmodium species or mixed type.
- **ITN Utilization:** The individual were considered as sleeping under ITN if he/she was using ITN starting from three weeks before data collection period.
- **IRS:** The house was considered as sprayed if it was sprayed with antimalarial chemicals within the last six months before data collection.
- **Swamps:** If there is a piece of wet, spongy land, low ground saturated with water in the area
- **Holes:** Presence of any opening of any size between walls of the house which allow entrance of mosquito.
- **Screened window:** If all available windows do not allow the entrance of anopheles mosquitos.
- **Presence of ITN:** If at least one ITN is available in the house (either used or unused).
- **Travel history:** A respondent is considered as having travel history if s/he had travel history to malaria endemic areas three weeks before data collection period.
- **Staying outside home:** the respondent is considered as staying outside home if he /she stays outside home beyond 3:00 o'clock local time at night.

4.9. Data Collection instrument and procedure

4.9.1. Data collection instrument

Data were collected by using a pre-tested structured questionnaire adapted from different literature and translated into Afaan Oromoo(8,38,39). The questionnaire consists of socio demographic characteristics of the respondents as well as malaria prevention related variables, housing condition and environment and personal activity related variables. To classify as cases and controls laboratory result were checked from laboratory registration book and medical record number were also used to select controls based on their arrival.

4.9.2. Data collection procedure

Face to face interviewer-administered questionnaire was employed on malaria infected individuals in the kakie hospital and health center in the town to get primary data on demographics and potential risk factors, such as socio-demography, environmental factors, and use of malaria prevention measures. The same questionnaire was used to collect data on potential risk factors from the control group. Cases were selected based on definitions developed after they completed their examination (exit interview), and patient laboratory result were taken from the laboratory registration book to link the results of the diagnosis. Then, they were interviewed for other relevant information. After the recruitment of cases, controls who lived in the same study area as cases were included based on the arrival to the health facility by using medical record number (i.e those who came immediately next to each case and fulfils inclusion criteria).

4.10. Data quality management

Training was given for four clinical nurses (who were yet not get employed and living outside of the study area) and one health officer for 2 days on the data collection tools and techniques of interviewing with practical exercises. Daily supervision was made by the supervisor and principal investigator. Questionnaire was pre-tested on 5% of samples a week before actual data collection period in the keto health center which is 9km from kakie town. In addition, at time of data collection, filled questionnaires were checked for completeness and consistency of information by supervisors on a daily basis and typographic errors were manually edited. Any ambiguity and other problems related to data collection were addressed by communicating with the data collectors. The purpose of the collected data was hidden from the data collectors. Profession of data collectors was also hidden from the patients to prevent social desirability bias and data collection was also taken place after they took treatment.

4.11. Data processing and analysis

The collected data were checked for completeness and missing data. After each filled questionnaires were coded they were entered in to Epi data version 3.1. Then the data were exported to SPSS version 21 and checked for outliers and normality. After cleaning and organizing the data descriptive statistics such as mean, standard deviation (SD), percent and frequency were calculated. Bivariate analysis was conducted for all predictors with their proportions and crude odds ratio against outcome variable to identify candidate variables. Variables with P value < 0.25 were included into multivariate analysis for adjustment. Final multivariate model was generated by using backward stepwise method and analysis was computed by logistic regression. Finally adjusted odds ratio (AOR), 95 % CI to assess strength of association and P value < 0.05 was estimate to report adjusted findings. Finally the findings were presented by tables and text.

4.12. Ethical consideration

Ethical clearance was obtained from the Institutional Review Board of Jimma University Institute of Health. Official cooperation letter was obtained from Kellem Wollega zone health department and Dale Wabera Woreda health office to undertake the study. Informed verbal consent was obtained from each study participants after clear explanation about the purpose of the study. Also the respondents' right to refuse or withdraw from participating in the interview was fully ensured and the information of each participant were kept confidential.

4.13. Dissemination plan

The findings of this study will be presented to Jimma University, Institute of health, department of Epidemiology. It will also distributed to ORHB, Kellem Wollega Zone health office and Dale Wabera Woreda health office. The findings may also be presented in different seminars and meetings and effort will be made to publish in a peer reviewed scientific journal.

Chapter five: Result

5.1. Socio demographic characteristics of the respondents

A total of 238 study participants 119 each for cases and controls were recruited. The response rate of the study participants was 100% for both cases and controls (Table 2). Fifty three (44.5%) cases and 54(45.4%) of controls were male. The mean age of the respondents was 30.13(12.416SD) years for cases and 29.44(10.941SD) for controls. In relation to educational status, 50(42%) and 56(47.1%) of the respondents had primary education (1-8) among cases and controls. When compared with other occupation more of the respondents were house wife. Majority of the respondents (93%) are Oromo, while only 1(0.8%) of the cases and 2(1.7%) of the controls were Gurage in ethnicity. The study shows that 80(76.2%) of the cases were married followed by unmarried ones. As it was observed from table 2, 55(46.2%) of cases and 45(37.8%) of controls were protestants followed by Islamic religion followers, which was 38(31.9%) and 44(37%) in cases and controls respectively (Table 2).

Table 2: Socio demographic characteristic of the study participants, Kakie town, March 01-April 30, 2019

S.no	Variables		Cases (N=119)	Control (N=119)	P.value	COR(95%CI)
			N (%)	**N (%)**		
1	Age	<=15	11(9.2)	11(9.2)	0.46	0.64(0.2,2.1)
		16-30	62(52.1)	58(48.7)	0.42	0.69(0.28,1.71)
		31-45	32(26.9)	41(34.5)	0.16*	0.5(0.19,1.31)
		46+	14(11.8)	9(7.6)	Ref	
2	Sex	Male	53(44.5)	54(45.4)	0.89	0.97(0.58,1.6)
		Female	66(55.5)	65(54.6)	Ref	
3	Work	House wife	40(33.6)	33(27.7)	0.85	1.07(0.52,2.22)
		Farmer	24(20.2)	11(9.2)	0.16*	1.9(0.78,4.78)
		Daily laborer	7(5.9)	10(8.4)	0.4	0.62(0.2,1.89)
		Gov't/NGO	11(9.2)	14(11.8)	0.46	0.69(0.26,1.83)
		Merchant	11(9.2)	28(23.5)	0.02*	0.35(0.14,0.85)
		Student	26(21.8)	23(19.3)	Ref	
4	Family size	<5	61(51.3)	70(58.8)	0.24*	0.74(0.44,1.23)
		>5	58(48.7)	49(41.2)	Ref	
5	Education	Illiterate	39(32.8)	24(20.2)	0.13*	2.17(0.79,5.91)
		Primary 1-8)	50(42)	56(47.1)	0.72	1.2(0.46,3.06)
		Seco. (9-12)	21(17.6)	27(22.7)	0.95	1.04(0.37,2.92)
		Higher (12+)	9(7.6)	12(10.1)	Ref	
6	Religion	Islam	38(31.9)	44(37)	0.246*	0.71(0.39,1.27)
		Orthodox	26(21.8)	30(25.2)	0.31	0.71(0.37,1.37)
		Protestant	55(46.2)	45(37.8)	Ref	

7	Ethnicity	Oromo	111(93.3)	111(93.3)	0.57	2(0.18,22.38)
		Amhara	7(5.9)	6(5)	0.53	2.3(0.17,32.58)
		Gurage	1(0.8)	2(1.7)	Ref	
8	Current marital status	Single	36(30.3)	47(39.5)	0.79	1.3(0.18,9.72)
		Married	80(67.2)	69(58)	0.88	0.86(0.12,6.29)
		Divorced	1(0.8)	1(0.8)	1	1(0.03,29.8)
		Widowed	2(1.7)	2(1.7)	Ref	

* =Candidate variables for multivariate analysis, N= Number

5.2. Housing condition and environment related factors

Among the case and control group, 107(89.9%) and 94(79%) houses were built from mud and sticks, while few were built from only woods in both cases and controls. Twenty two (18.5%) and 9(7.6%) of the respondents house had holes/cracks in cases and controls respectively. Forty nine (41.2%) and 44(37%) of respondents house had opening between walls and eaves in cases and controls respectively. Eighty one (68.1%) and 100(84%) of the respondents had ceiling for their house in cases and controls respectively. Majority of the houses of the respondents had windows and 76(69.1%) and 61(52.6%) of the windows' had screening in cases and controls respectively. One hundred ten (92.4%) and 97(81.5%) of cases and controls houses' doors were made from wood respectively. There were 22(18.5%) and 12(10.1%) open deep wells in respondents' compound in cases and controls respectively. There were no swampy areas and stagnant water in the areas of both in cases and controls. As it is seen from table below, majority of the respondents' house' had no potted plants in their compound. This is also true in relation with gutter in which most of the respondents' house there were no gutter. There were 2(1.7%) old tyres which can collect rain waters in cases (Table 3).

Table 3: Bivariate result for housing and environmental condition related variables, Kakie town, March 01-April 30, 2019

Housing and environmental related variables		**Cases(=119)**	**Controls(N=119**	**P-value**	**COR(95% C.I)**
		N (%)	**N (%)**		
Walls	Mud and sticks	107(89.9)	94(79%)	0.648	0.57(0.05,6.38)
	Bricks	8(6.7)	21(17.6)	0.2*	0.19(0.015,2.4)
	Wood	2(1.7)	3(2.5)	0.47	0.33(0.02,6.65)
	Other*	2(1.7)	1(0.8)	Ref	
Holes in the walls	Yes	22(18.5)	9(7.6)	0.02*	2.77(1.22,6.31)
	No	97(81.5)	110(92.4)	Ref	
Opening b/n walls and eaves	Yes	49(41.2)	44(37)	0.51	1.19(0.71,2.01)
	No	70(58.8)	75(63)	Ref	
Ceiling of the house	Yes	81(68.1)	100(84)	0.005*	0.41(0.22,0.76)
	No	38(31.9)	19(16)	Ref	
Presence of windows	Yes	109(91.6)	116(97.5)	0.06*	0.28(0.08,1.05)
	No	10(8.4)	3(2.5)	Ref	
Screened window	Yes	76(69.7)	61(52.6)	0.009*	2.08 (1.2,3.59)
	No	33(30.3)	55(47.4)	Ref	
Type of door	Wood	110(92.4)	97(81.5)	0.015*	2.77(1.22,6.31)
	metal	9(7.6)	22(18.5)	Ref	
Potted plants	Yes	17(14.3)	16(13.4)	0.85	1.07 (0.51,2.24)
	No	102(85.7)	103(86.6)	Ref	
Open deep well	Yes	22(18.5)	12(10.1)	0.07*	2.02 (0.95,4.30)
	No	97(81.5)	107(89.9)	Ref	
Gutter	Yes	3(2.5)	2(1.7%)	0.653	1.513 (0.248,9.222)
	No	116(97.5)	117(98.3)	Ref	
Uncovered water in the compound	Yes	10(8.4)	6(5)	0.31	1.728 (0.607,4.917)
	No	109(91.6)	113(95)	Ref	
Old tires	Yes	2(1.7)	3(2.5)	0.65	0.66 (0.11,4.03)
	No	117(98.3)	116(97.5)	Ref	

= candidate variables for multivariate analysis, other= stone

N= Number

5.3. Malaria prevention method related variables

From the total of the study participants, 83(69.7%) and 90(75.6%) of the cases and controls had ITNs in their homes and 64(77.1%) and 68(75.6%) of those who had ITNs sleep under it respectively. From the respondents who slept under ITN, 21(32.8%) and 40(58.8%) of the cases and controls always sleep under ITN respectively (Table 4).

Table 4: Bivariate result for Malaria prevention related variables, Kakie town, March 01-April 30, 2019

Malaria prevention related variables		Cases(N=119	Controls(N=119	P-value	COR(95% C.I)
		N (%)	N (%)		
Presence of ITN	Yes	83(69.7)	90(75.6)	0.31	0.74 (0.42,1.32)
	No	36(30.3)	29(24.4)	Ref	
Sleep under ITN	Yes	64(77.1)	68(75.6)	0.81	1.09 (0.5,2.2)
	No	19(22.9)	22(24.4)	Ref	
How often sleep under ITN	Always	21(32.8)	40(58.8)	0.003*	0.34 (0.17,0.69)
	Sometimes	43(67.2)	28(41.2)	Ref	
IRS	No	119(100)	119(100)		

*=candidate variables for multivariate analysis, N= Number

5.4. Human activity related variables

According to the study, 9(7.6%) of the cases had travel history to malaria endemic areas and only 6(5%) of the controls had also travel history to malaria endemic areas in the past three weeks before time of data collection. It is also seen from table below that 53(44.5%) of the cases stayed outside at night beyond 3'oclock local time. Twenty eight (23.5%) of controls had history of staying outside home at night (Table 5).

Table 5: Bivariate result for human activity related variables, Kakie town, March 01-April 30, 2019

Candidate variables		Cases(N=119)	Controls(N=119)	P-value	COR(95% C.I)
		N (%)	N (%)		
Travel history	Yes	9(7.6)	6(5)	0.43	1.54 (0.53,4.47)
	No	110(92.4)	113(95)	Ref	
Staying outside at night beyond 3 o'clock	Yes	53(44.5)	28(23.5)	0.001*	2.6 (1.49,4.56)
	No	66(55.5)	91(76.5)	Ref	

*candidate variables for multivariate analysis,

N= Number

There were 14 variables which were candidates for multivariate analysis (P.value <0.25) in the bivariate analysis (Table 1-4 above). These variables were age, religion, educational status, occupation, family size, walls of the house, holes/cracks in the walls, ceiling, window, screening of windows, type of door, open deep wells, how often respondents sleep under ITN and staying outside at night for a few hours.

5.5. Multivariate logistic regression analysis

All variables that were candidate for multivariate analysis (P.value <0.25) with the outcome variable in the bivariate analysis were entered backward stepwise to multiple logistic regression models and three variables were found to have a statistically significant independent association with malaria infection. The odds of developing malaria infection was five times higher among study participants whose house had holes when compared with those houses with no holes/cracks [AOR= 4.87, P.V=0.029, 95%CI (1.17, 20.25)]. Similarly the odds of developing malaria infection was three times higher among study participants who had history of staying outside at night beyond 3 o'clock local time at night relative to those did not stay outside beyond 3 o'clock local time at night [(AOR= 3.4, P.V.= 0.006 95% CI=(1.4 ,8.1)]. The odds of getting malaria infection was 70.3% less likely among those who always sleep under ITN compared with those who did not sleep under ITN regularly (sometimes) [AOR= 0.297, P.V=0.002, 95%CI= (0.136, 0.65)] (Table 6).

Table 6: Multiple logistic regression analysis result of variables with significant association to malaria infection, Kakie town, March 01-April 30, 2019

Significant Variables		**Cases (N=119)**	**Controls (N=119)**	**P.value**	**COR**	**AOR(95%CI)**
Holes in the walls of house	Yes	22(18.5)	9(7.6)	0.029	2.77	4.87(1.17,20.25)
	No	97(81.5)	110(92.4)	Ref	Ref	
How often sleep under ITN	Always	21(32.8	40(58.8)	0.002	0.34	0.297(0.136,0.65)
	Sometimes	43(67.2)	28(41.2)	Ref	Ref	
Staying outside at night beyond 3 o'clock	Yes	53(44.5)	28(23.5)	0.006	2.6	3.4 (1.4 ,8.1)
	No	66(55.5)	91(76.5)	Ref	Ref	

N= Number

Chapter six: Discussion

Malaria is a major problem in public health across the globe, predominantly in sub-Saharan countries including Ethiopia due to different factors like environmental and human characteristics that support malaria transmission. Malaria is one of the infectious diseases with different possible risk factors. Among these factors socio demographic factors were one. According to this study socio demographic factors were not risk factors for acquiring malaria infection. In this study sex of the respondents had no association with acquiring malaria infection. The finding of this study was similar with the study conducted in central Madagascar to identify risk factors of malaria infection. Unlike the finding from Madagascar and this study, finding of case control study in Dambia district showed male populations were more at risk of acquiring malaria infection than female counterparts (AOR=2.2). The difference might be due to study time during which population move to different area for harvest and might sleep outside home during the harvest(25,40).

Due to the unstable and seasonal pattern of malaria transmission, the protective immunity of the population is generally low and all age groups are at risk of infection and disease. As the finding of this study showed, age of study population had no association with malaria infection. This was different from cross sectional study conducted in East Shoa among adult groups, in which age groups from 15-24(AOR=6.7), 25-34(AOR=4.2), 35-44(AOR=3) were at risk when compared with those age >45 years. Another study conducted in northern Ethiopia shows age group 15-24 years were 3.2 times at risk than other age group(17,28).

Other socio demographic factors like family size and educational status had no association with malaria infection in this study. In contrast to this, study conducted in west Armachiho indicated those who cannot read and write (illiterate) were more at risk of malaria infection (AOR=8.22) than those with other level of education(41). Family size had also no association with malaria infection in this study. This is similar with study conducted on prevalence and associated factors of malaria in Dilla town and surrounding areas and south Ethiopia(30,31).

Malaria is one of the preventable diseases which can be prevented by using ITNs and IRS. The finding of this study showed that both cases and controls had no indoor residual spray for their home in the last six months prior to the study period. In this study sleeping under ITN had no association with malaria infection rather it had association with how

often they sleep under ITN (AOR=0.297). This means those who sleep under bed net regularly had 0.297 times less likely to contract malaria infection. A case control study conducted to identify malaria risk factors in Zimbabwe showed sleeping regularly under bed net (AOR= 0.3) was protective against malaria. It was also similar with finding from North West of Nigeria, where it showed daily utilization of ITN ($x2 = 33.6$, $p = 0.000$) was protective in pregnant women of the study area. This was also supported by study conducted on malaria outbreak investigation in Simada district of North West Ethiopia which showed not using ITN was 5.85 times risk for malaria(27,42,43).

Transmission of malaria is also governed by different housing conditions and environmental factors. The finding of this study showed that there were no stagnant water and swampy area in study area for both of the cases and controls. But different study in different areas showed presence of stagnant water near home of the study population had association with contracting malaria infection(25,39). Multivariate analysis result of this study showed peoples whose house had holes were 4.87 times more at risk of acquiring malaria infection than those who lived in houses with no holes. This might be due to allowance of the mosquito to easily enter through the holes and transmit the infection. In this study, openings between eaves and walls of the house (P.Value= 0.507) had no association with malaria disease. This result was different from malaria outbreak investigation conducted in Zimbabwe (AOR= 2.4) and study conducted in Malawi (AOR=2.08)(18,44). In this study, other variables like walls of the house, ceiling of houses, windows, types of door, potted plants, presence or absence of old tyres in the housing unit were not risk factors for acquiring malaria. The find of this study was similar with longitudinal study in Bangladesh where structure of the wall of house had no association with malaria. Unlike the above finding, study conducted in two health centers of south Ethiopia showed type of walls had significant association with malaria morbidity(31,45).

In addition to other factors malaria can also be affected by human activity related factors. Of this travel history of the study participant was one. The finding of this study showed travel history had no significant association with presence or absence of malaria infection. This finding was inconsistent with studies conducted in different parts of Ethiopia like Tigrai and Hadiya Zone(36,46). Human activity related factor which had significant association with malaria infection in this study was staying outside at night beyond 3 o'clock (AOR=3.4). This finding was supported by study conducted in Indonesia

(AOR=14.37), Senegal (AOR=8.83), Dambia district (AOR=5.7) and Laelay Adyabo district of Northern Ethiopia (AOR=3.7) (19,25,38).

6.1. Limitation of the study

Due to shortage of time and resources home visit was not conducted to verify the presence and utilization of ITN as well as to see structure of the house. Issue of drug resistance was not investigated for the study area. Study period was another limitation.

Chapter Seven: Conclusion and Recommendation

7.1 Conclusion

From the study results, three variables had significant association with malaria infection. The chance of acquiring malaria was lower among respondents who regularly sleep under ITN. It was also clearly observed that those who stay outside at night for few hours were more at risk of acquiring malaria infection. This shows that those who stay outside did not use protective clothes. Those whose house had holes had more chance of being infected with malaria when compared with counter parts. This finding the study indicated that majority of respondent lives in houses with holes in the walls. In the study area there were no stagnant water and swampy areas which can affect malaria transmission. Even though the chance of being infected with malaria were different in socio demographic factors, any of variables in this study had no association with malaria. This was also true for other variables like travel history, possession of ITN and different water containing materials in the living compound.

7.2 Recommendations

To reduce malaria prevalence and the risk it poses, it is recommended that the under mentioned activities should be implemented.

1. Even though IRS has no association with malaria, since it is a proven method of malaria prevention method and there was no IRS in the study area, Dale Wabera Woreda health office, Zonal health department and Oromia Regional Health Bureau in collaboration with NGO working on malaria should plan to undertake indoor residual spray.
2. Dale Wabera Woreda health office in collaboration with urban health extension workers, should give awareness on regular ITN utilization.
3. Since staying outside at night for few hours was independent risk factor for acquiring malaria infection in the study area, health extension workers should give information for residents of the area to use protective clothes at night.
4. Effort should be made by HEWs and Woreda health office to give awareness for the residents to block the holes of their houses to prevent malaria infection.
5. Researchers need to investigate whether holes in the walls of house has association with malaria, since few is said about holes in the walls of houses.

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Annex: Questionnaire

Informed Consent

Read this for the respondent!

Hello, my name is _____ I am collecting data for research purpose on malaria infection determinant factors in Kakie town, which is conducted by Mr. Tariku Lema for a partial fulfilment of master degree in Field Epidemiology. The information you provide will contribute to improve malaria prevention and control in the district. If you are volunteer to involve in this study, I would like to ask you some questions and it will take about 20 to 30 minutes. The information you give us will be kept confidential, and neither your name nor other personal identification of yours will be disclosed or published. If there is any problem you can stop at any time and withdraw from the study.

Do you have any questions? May I begin the interview now?

Respondent agrees to be interviewed . . . 1 Respondent does not agree to be interviewed . . . 2 end

I hope we will finish this interview successfully.

Annex 1: English version Questionnaire

Identification

Keble_____ Id. of respondent_____

Zone_____

Section 1: Socio-demographic characteristics of the respondents

No.	**Questions**	**Responses**	**Skip to**
101	Case status	1. Case 2. Control	
102	Sex of the respondent:	1. Male 2. Female	
103	What is your age in full years?	Year_____	
104	What is your religion?	1. Islam 2. Orthodox 3. Protestant 4.Other(specify)_____	
105	What is your ethnic group?	1. Oromo 2. Amhara 3. Gurage 4.Other(specify)_____	
106	What is your current marital status?	1. Single 2. Married 3. Divorced 4. Widowed	
107	What is your educational status?	1. Illiterate(can't read and write) 2. Primary education(1-8) 3. Secondary education(9-12) 4. Higher education(12+)	
108	What is your current main work/occupation?	1. Housewife 2. Farmer 3. Daily labourer 4. Government/NGO employee 5. Merchant 6. Student 7.Other(specify_____	

109	How many people currently live in the household?	Total number of household members ____	

Section 2: Housing condition and Environment

No.	**Questions**	**Responses**	**Skip to**
110	What type of material is used to make the walls?	1. Mud and sticks 2. Iron sheets 3. Bricks 4. Stone 5. Wood 6. Other (Specify)	
111	Are there any cracks or holes in the walls?	1. Yes 2. No	
112	What type of material is used to make the roof?	1. Iron sheets 2. Tin 3. Grass 4.Other(specify)_____	
113	Are there openings between the roof and walls?	1. Yes 2. No	
114	Does the house have a ceiling?	1. Yes 2. No	
115	Does the house have windows	1. Yes 2. No	If no to Q#115 go to Q#117
116	Does the house have screened windows?	1. Yes 2. No	
117	What type of material is used to make the door?	1. Wood 2. Metal 3. Glass 4.Others(specify)_____	
118	Are there potted plants in the housing unit?	1. Yes 2. No	
119	Is there open deep well in your compound?	1. Yes 2. No	
120	Is there gutter to collect rain water in your compound?	1. Yes 2. No	
121	Is there any uncovered water storage in your compound?	1. Yes 2. No	

122	Is there old tires that contains water?	1. Yes 2. No	
123	Are there swamps near the homestead	1. Yes . 2. No	
124	If yes distance from individual's home	. _____(km)	
125	Is there stagnant water near to your home?	1. Yes 2. No	If no to Q#125,go to Q#127
126	If yes to Q125, what is the distance from home in kilometre?	_____(km)	

Section 3: Malaria Prevention method related

127	Is there ITN in your home?	1. Yes 2. No	If No to Q#127 go toQ#130
128	If yes did you sleep under ITN in last three weeks?	1. Yes 2. No	If No to Q#128 go to Q#131
129	If yes how often do you sleep under ITN	Always Sometimes	
130	Is your house sprayed with malaria repellent in the last 6 months?	1. Yes 2. No	

Section I4: Personal activity related

131	Have you travelled to malaria endemic area in the last 2-3wks?	1. Yes 2. No	
132	Do you stay outside of home at night beyond 3:o'clock	1. Yes 2. No	

Thank you!

Date of Data collection_____

Name and signature of Data collector_____

Name and signature of supervisor_____

Annex 2: Af- gaaffii Afaan Oromoon

Gaaffilee qorannoo

Eenyummeessa

Ganda_____Lakk.Eenummaa_____

Zoonii_____

Kutaa1: Odeeffannoo haala jireenya hirmaattotaa

T.L	Gaaffilee	Deebii	darbi
101	Haala yaalamaa	1 busaa qaba 0 busaa hin qabu	
102	Saala hirmaataa/ttuu	1. Dhiira 2. Dhalaa	
103	Umuriin kee waggaadhan meeqa?	waggaa [_____]	
104	Amantaan kee maali?	1. Musliima 2. Ortoodoksii 3. Protestaantii 4. Kan biro(caqasi)----------	
105	Sabni kee maali (sabi irraa dhalatte)?	1. Oromoo 2. Amaara 3. Guraagee 4. Kan biro(caqasi)_____	
106	Haalli gaa‟ela kee maali?	1. Kan heerumte /fuudhe 2. Kan hin heerumne/ hin fuune 3. Kan hiike/ hiikte 4. Kan haati manaa ykn abbaan manaa jalaa du‟e	
107	Sadarkaan barnootaa kee maal fakkaata?	1. Barreessuu fi dubbisuu kan hin dandeenye 2. Sadarkaa 1ffaa(1-8) 3. Sadarkaa 2ffaa(9-12) 4. Sadarkaa olaanaa(12+)	

108	Hojiin kee kan ammaa maali?	1. Haadha warraa 2. Qotee bulaa 3. Dafqaan bulaa 4.Hojjetaa mootummaaa/Miti mootummaaa 5. Daldalaa 6. Barataa/ttuu 7. Kan biroo(caqasi)	
109	Lakkofsi maatii kee meeqa?	Lakkofsa miseenota maatii ____	

Kutaa 2: Haala Ijaarsa manaa fi Haala Naannoo

110	Dhaabni manaa maal irraa ijaaarame?	1. Dhoqqee fi mukarraa 2. Sibiila ayiranii irraa 3. Bilookeetii irraa 4. Dhaagaa irraa 5. Muka irraa 6. Kan biraa(ibsi) ____	
111	Dhaabni manaa qaawwaa yookan dhoohinsa qabaa?	1. Eeyyee 2. Lakki	
112	Gubbaan manaa maalin haguugame?	1. Sibila ayiranii 2. Tiinii 3. Citaa/Marga 4. Kan biroo_____	
113	Gubbaa manaa fi dhaaba manaa gidduu qaawwi jiraa?	1. Eeyyee 2. Lakki	
114	Manni Koornasii qabaa?	1. Eeyyee 2. Lakki	
115	Manni foddaa qabaa?	1. Eeyyee 2. Lakki	Yoo lakkii jette G117
116	Foddaan qaawwa qilleensa seensisu qaba?	1. Eeyyee 2. Lakki	
117	Balballi manaa maal irraa hojjatame?	1. Muka 2. Sibiila	

		2. Fuullee 3. Kan biraa(ibsi)	
118	Kellaa keessa biqiltuun dhabame jiraa?	1. Eeyyee 2. Lakki	
119	Kellaa keessa boolli biirii/eelaa qadaada hin qabne jiraa?	1. Eeyyee 2. Lakki	
120	Kellaa keessa bo'oon bishaan keessatti kuufamu jiraa?	1. Eeyyee 2. Lakki	
121	Kellaa keessa meeshaan bishaan itti kuufamee taa'u kan qadaada hin qabne jiraa?	1. Eeyyee 2. Lakki	
122	Kellaa keessa gommaan konkolaataa bishaan kuusee taa'u jiraa?	1. Eeyyee 2. Lakki	
123	Naannoo manaa caffeen ciraa?	1. Eeyyee 2. Lakki	Yoo lakkii jette G125tti cehi
124	Yoo eeyyen ta'e mana irraa hammam fagaata?	_____(km)	
125	Naannoo manaa bishaan kuufamaan jiraa?	1. Eeyyee 2. Lakki	Yoo lakkii jette G127tti cehi
126	Yoo deebiin eeyyee ta'e mana irraa ammam fagaata(km)	_____(km)	

Kutaa 3: Maloota ittisa Busaa

127	Agoobara mana keessaa qabduu?	1. Eeyyee 2. Lakki	Yoo lakkii jette G130tti cehi
128	Yoo deebiin G127 eeyyee ta,e, Agoobara jala torbee sadan darban jala raftaa turteettaa?	1. Eyyee 2. Lakki	
129	Yoo deebiin G128 eeyyee ta,e, yeroo kam jala ciifta?	1. Yeroo hunda 2. Darbee darbee	
130	Manni keessan ji,a 6'n darbe keessa keemikaala farra bookee busaa biifamee beekaa?	1. Eeyyee 2. Lakki	

Kutaa 4: Haala sochiin wal qabatu

131	Torbee lamaan sadan kana keessa bakka busaan baay'inaan jiirtu deemtee	1. Eeyyee 2. Lakki	
132	Halkan sa'aatii 3 booda alan turtaa?	1. Eeyyee 2. Lakki	

Galatoomaa!