COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

UTILIZATION OF LONG LASTING INSECTICIDAL NETS AND ASSOCIATED FACTORS IN BORICHA AND BILATE ZURIA WOREDA, SIDAMA REGION, SOUTHERN ETHIOPIA: CROSS SECTIONAL STUDY

BY:

MESELE ALARO (BSc)

NOVEMBER, 2023

HAWASSA, ETHIOPIA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

UTILIZATION OF LONG LASTING INSECTICIDAL NETS AND ASSOCIATED FACTORS IN BORICHA AND BILATE ZURIA WOREDA, SIDAMA REGION, SOUTHERN ETHIOPIA: A CROSS SECTIONAL STUDY

BY:

MESELE ALARO (BSc)

A MPH THESIS SUBMITTED TO HAWASSA UNIVERSITY, COLLEGE OF MEDICINE AND HEALTH SCIENCES SCHOOL OF PUBLIC HEALTH IN PARTIAL FULFILLMENT OF THE MASTERS OF PUBLIC HEALTH IN EPIDEMIOLOGY

ADVISORS: 1.TAREKEGN SOLOMON (MPH, PHD, ASSISTANT PROFESSOR)

2. MESKEREM JISO (MPH, Lecture)

NOVEMBER, 2023

HAWASSA, ETHIOPIA

Declaration

I hereby declare that this MPH proposal titled “Utilization of Long lasting insecticidal nets and associated factors in Boricha and Bilate Zuria Woredas, Sidama Region, Southern Ethiopia: a cross sectional study” is my original work and has not been presented for a degree in any other university, and all sources of material used for this thesis have been duly acknowledged.

Name: _____

Signature: _____

Date: _____

Approval sheet

We, the undersigned, Examiners of the final MPH open defense, certify that we have read and evaluated the proposal prepared by Mesele Alaro, entitled “utilization of Long lasting insecticidal nets and associated factors in Boricha and Bilate Zuria Woredas, Sidama Region, southern Ethiopia: a cross sectional study” .And examined the candidate’s oral presentation. This is, therefore, to certify that the thesis is accepted as fulfilling the thesis requirements for a Master of Public Health in Epidemiology.

_____	_____	_____
Name of the chairperson	Signature	Date
_____	_____	_____
Name of the principal advisor	Signature	Date
_____	_____	_____
Name of the Co-advisor	Signature	Date
_____	_____	_____
Name of the Internal examiner	Signature	Date
_____	_____	_____
Name of the External examiner	Signature	Date
_____	_____	_____
Name of the coordinator	Signature	Date

Acknowledgement

Foremost, I am grateful to Hawassa University College of Medicine and Health Sciences School of Public Health for giving me this chance to commence the proposal work. I would like to thank my major advisor Dr. Tarekegn Solomon and my co-advisor Meskerem Jiso, for their encouragement, constructive guidance and kind comments. I am very indebted to their valuable comments on this thesis.

I also greatly acknowledge data collectors and supervisors for their unreserved help for proper and timely accomplishment of data collection

I must express my very profound gratitude to my family and friends for their support and encouragement during this proposal work.

Table of contents

List of tables

List of figures

Acronym/abbreviation

HH	House Hold
ITN	Insecticide Treated Nets
LLIN	Long Lasting Insecticidal Nets
WHO	World health organization

Abstract

Background: Malaria is a major cause of mortality and morbidity in developing countries. Sleeping under long lasting insecticidal nets (LLIN) is the most widely adopted preventive measure against malaria. LLINs represent a cost effective means of malaria prevention for at risk populations. Even though there have been studies indicating the utilization of LLIN use in Southern Ethiopia, there is no study conducted in Sidama region, Boricha and Bilate Zuria Woredas.

Objective: The objective of this study was to assess utilization and associated factors of long lasting insecticidal nets in Boricha and Bilate Zuria Woredas, Sidama, Ethiopia in 2023.

Methods: A community based cross sectional study was conducted in Boricha and Bilate Zuria woredas from February to March 2023. A total of 726 households were included in the study. A multi stage sampling technique was used to obtain the intended sample size. Quantitative data were collected using a structured questionnaire using face to face interview. The collected data were entered using Epi data version 3.1, and finally analyzed using SPSS version 20. Binary logistic regressions were computed to identify associated variables with the utilization of LLIN. Variables having P value < 0.25 in bi-variable analysis were candidate for multivariable analysis. Variables with P-Value <0.05 were declared as independent predictors of LLIN utilization at alpha 5%.

Results: The proportion of people utilizing LLIN was 85.5% with 95% CI of (82.5% - 88.1%). Having one LLIN (AOR= 3.55; 95% CI of (1.92, 6.57) compared to two and more LLIN and family size of less than 5 persons (AOR= 0.60; 95% CI 0.37, 0.96) compared to 5 and more persons were independently associated with LLIN utilization.

Conclusions: Percentage of long-lasting insecticide-treated nets (LLINs) that were used by anyone the night before the study was high compared to the national 62.3% according to malaria indicator survey of 2015. It was significantly associated with number of LLIN and family size.

Keywords: long lasting insecticidal nets, utilization, Sidama, Ethiopia

1. Introduction

1.1 Background

Malaria is a protozoan disease transmitted by the bite of infected *Anopheles* mosquitoes. There are five species of the genus Plasmodium which cause nearly all malarial infections in humans. These are P. falciparum, P. vivax, P. ovale, P. malariae, and P. knowlesi. Almost all deaths of malaria are caused by falciparum malaria (1).

Vector control through the use of long-lasting insecticidal nets (LLINs) is a widely implemented tool for the prevention of malaria.(2) LLINs are effective because in the majority of malaria-endemic regions of the world, the female mosquito that transmits malaria only bites at night (3).

This highly effective vector control method protects people from malaria-carrying mosquitoes in at least three ways: By acting as a physical barrier between mosquitoes and the people sleeping under the net ,the chemical in LLINs repels mosquitoes, or kills them when they land on the net and through the 'community effect', which occurs when the majority of people in a community sleep under an LLIN, resulting in an overall reduction of the mosquito population and its lifespan, thereby reducing the transmission of malaria (4).

Since 2005, about 2.5 billion LLIN mainly of pyrethroid -only LLINs, have been distributed for malaria prevention globally. There is an increase in possession of LLIN in sub-Saharan Africa in the past 20 years .By 2021, 68% of households in sub-Saharan Africa had at least one LLIN, an increase from about 5% in 2000. (3)

The percentage of households in sub Saharan Africa owning at least one LLIN for every two people increased from 1% in 2000 to 38% in 2021(5). The utilization pattern of LLIN also increased in the past 20 years. The percentage of the population sleeping under LLIN increased considerably from 2% in 2000 to 47% in 2021 for the whole population (5).

The ownership coverage of LLIN in Ethiopia also increased from time to time .In 2017 the net ownership coverage was 64.8% in 2017 , and increased to 67% in 2020 while performance report in 2019 shows 85%(3). But one of the challenges facing Ethiopia is low utilization of LLIN Hence estimating the current prevalence of utilization and identifying the factors associated with low utilization of LLIN is needed.

1.2. Statement of the problem

Malaria remains a preventable cause of serious death and illness worldwide (6). According to world malaria report 2022, globally there were an estimated 247 million malaria cases in 2021 in 84 malaria endemic countries, an increase from 245 million in 2020, Since 2016, malaria cases have increased; the largest annual increase of 13 million cases was observed between 2019 and 2020 during the first year of the COVID19 pandemic(5).

Most of the increase in malaria case and death globally contributed by sub-Saharan Africa country. In this continent the estimated malaria cases and deaths are increasing. Between 2019 and 2021 ,an increase in estimated malaria case from 218 million to 234 million and deaths from 544,000 to 593,000 globally from these 95% of cases and 96% of deaths contributed by Africa (5).

In Ethiopia, malaria remains to be one of the major public health and socioeconomic problems despite its dramatic reduction in the last two decades. Apart from illness and deaths, it posed persistent socio-economic impacts particularly to more than eighty per cent of the country's rural community. For example, overlapping of transmission of the disease with the major harvesting and other agricultural activities contributes to a massive loss of productivity. A survey showed that malaria accounts for loss of 30% of the overall disability adjusted life years (DALYs) as well as imposing a high economic cost (3).

.

As part of sub-Saharan African countries the utilization of LLIN is one of the challenge facing Ethiopia in the fight against malaria (3). In Ethiopia the prevalence of utilization of LLIN varies from the lowest 21.5% to the highest 91.9%. In Gursum, Eastern Ethiopia 21.5% of the households utilized LLIN the night before the study (7) .Whereas in kola Diba town, Northern Ethiopia of the 260 households, ITN utilization was found to be 239(91.9%) (8) .

According to studies conducted in Ethiopia, LLIN condition, Average number of LLIN, being comfortable with LLIN, faced challenge using LLIN, Age, Educational status, Occupation, Income, Knowledge about transmission of malaria, Knowledge about LLIN, Belief LLIN should be treated, Got message/information about LLIN, number of LLIN in the

household, Family size, Number of bed rooms, number of beds /sleeping houses were significant factors for utilization of LLIN (4-18).

Even though there have been studies indicating the prevalence of LLIN use in southern Ethiopia Wonago, Arbaminch and Mirab Abaya to be 68.8%, 73.1% and 85% respectively. There is no study conducted in Sidama Region, Boricha and Bilate Zuria Woreda which is malaria endemic area. Therefore this study aimed to determine the prevalence of LLIN utilization and identify factors associated with utilization of LLIN in Boricha and Bilate Zuria Woreda, Sidama Region, Southern Ethiopia.(3)

1.3. Significance of the study

The prevalence of LLIN utilization and associated factors vary from place to place across the globe and thus the result of the study will determine prevalence and associated factors of LLIN utilization in Boricha and Bilate Zuria Woreda, Sidama Region, Southern Ethiopia. To improve the utilization status of LLIN in study population.

The study will yield more robust and recent evidence regarding prevalence and associated factors of LLIN utilization and hence knowledge concerning the factors of can be used in improving the utilization.

Doing this study will provide basic information for programme managers and policy makers targeting on prevention of malaria infection and reduction of mortalities and/ or morbidities. The findings may also provide a significant reference material to researchers working on this theme.

2. Literature Review

2.1. Prevalence of LLIN utilization

The prevalence of LLIN utilization varies from place to place (8). For example in in North Western Nigeria only 10.6% of the households use modern insecticides whereas in North Central Nigeria 33.6% of the households uses LLIN% (9). From a community based study in Uganda the prevalence of LLIN utilization was found to be 54.4% (10). In Democratic Republic of Congo 78.4% reported using of LLIN the night before the interview (11).

The reason for these variations suggested as seasonal variation, the acceptability of the nets in terms of size, color, and shape. Moreover, demographic characteristics such as age, education, size of household, and ethnicity influenced the use of bed nets mentioned as a reason of variation (8).

In Ethiopia the prevalence of utilization of LLIN varies from the lowest 21.5% to the highest 91.9%. In Gursum Eastern Ethiopia, 21.5% of the households utilized LLIN the night before the study (7) .Whereas in Kola Diba town Northern Ethiopia, of the 260 households, LLIN utilization was found to be 239(91.9%) (8) . Another study conducted in north western Ethiopia, the utilization of LLIN last night before the study was 80.4% (12).

In other way a comparable similarity has been seen in utilization of LLIN in Ethiopia. For example According to study conducted in Harar Regional State Eastern Ethiopia, it was revealed that 73.3% of the households slept under the net the previous night before the study (13). Similarly 73% of the households in Eastern Shoa,Oromia region were utilized the LLIN (14).

In Southern Ethiopia and the Gambella Region the prevalence of LLIN utilization in the night preceding the study was above the average 50%. A study conducted in Gambella shown that 52.3% utilization (15).Whereas the study in Arbaminch revealed that 73% utilization of LLIN(16).Another survey conducted in Southern Ethiopia Mirab Abaya Woreda ,and Wonago woreda revealed 85.1%(17) and 68.8% (18)

2.2. Factors Associated with utilization of long lasting insecticidal nets

2.2.1. Socio demographic factors

According to a study conducted in Eastern Ethiopia, farmers were 2.26 times more likely to utilize LLINs than other occupation (13). Another study in North Western Ethiopia shown that being employed family head has 8 times more chance of utilization compared to farmers(14).

Being house servant has less chance of utilization of LLIN.A study in North Western Ethiopia revealed that house servants had 72% less chance of utilization of LLIN compared to other counterpart (14). A study in Gursum district Eastern Ethiopia, revealed that farmers to have 87% less chance of utilization compared to other occupation (7) . Being house wife were 74% less likely to use LLINs than those of other occupations (7).

House hold heads without formal education are unlikely to use freely acquired LLIN compared to those having formal education. A research conducted in Nigeria, house hold heads having formal education are 1.57 times more likely to use LLIN than their counter parts (19). A study in Uganda also shows that significant association between education(p=0.018) and utilization of LLIN(10). A study conducted in Ethiopia also shown that family heads having higher level education are 4.8 times more likely to use LLIN compared to illiterate (14).

According to a research conducted in Kamwenge Uganda Married respondents (p=0.018) and having children under five years(p=0.048) have significant association with the utilization of LLIN (10).According to a study in North Western Ethiopia those households having monthly family income of 2501 to 3500 are 3.7 times more likely to utilize LLIN compared to their counter parts (12). In contrast another study in Southern Ethiopia revealed that as the income of the head of the households increase the odds of net utilization was found to decrease by 27% (16).

As the age of the head of the house hold increase the utilization of LLIN also increases. A study done in Gambella Western Ethiopia, showed that household headed by those aged 40–49 and 50+ years were 2.84 and 4.14 times more likely to use LLINs than those headed

by those aged <30 years respectively (15). Similarly a study conducted in North Western, Ethiopia, shown that being grandparent, had 3.7 times more likely utilization of LLIN compared to their counter parts (14). According to a research conducted in Southern Ethiopia being female head of households decreased the odds of net utilization by 56% (16).

2.2.2. **Household related factors**

Households having separate bedroom have more chance of LLIN utilization compared to their counterpart .A study conducted in Southern Ethiopia, revealed that those households having separate bed room are 1.98 times more likely utilization of LLIN compared to those who do not have separate bedroom (18).

Bed/sleeping areas shared by household members have significant association with utilization of LLIN. According to a research conducted in Gambella Western Ethiopia, Those households with bed/sleeping areas shared by three to five and six to seven members were 81% and 86% less likely to use LLIN respectively, than bed/sleeping areas shared by one to two household members (15).

Another similar study conducted in Eastern Shoa Ethiopia ,showed that sharing one bed with a member of 3-5 had 30% less chance of utilization compared to those not sharing (14). Having high family size had less utilization of LLIN compared to those having less family size. A study conducted in Gambella Western Ethiopia, has shown that households with family size of eight and above were 75% less likely to use LLNs than those households with family size of one to two (15) .

A study conducted in Southern Ethiopia revealed that households having two or more sleeping places are 2.58 times more chance of utilization of LLIN compared to their counterparts (20). Households having houses made from cement have less odd of LLIN utilization compared to those households made from mud. A community based cross sectional studies in Northern Ethiopia revealed that households made from cement is 97.7% times less odd of using LLIN than households made from mud (8).

Households having hanging bed nets have more chance of utilization of LLIN compared to those who do not have hanging bed nets .A study in southern Ethiopia showed those households who have hanging bed nets are 19.24 times more chance of LLIN utilization than households not having hanging bed nets and Households with walls of the house plastered or painted >12 months ago are 91% less chance of utilization of LLIN compared to their counter parts (17).

A study in Gambela Western Ethiopia ,showed that households with adolescents that had a sleeping pattern of males or females together were 84% and 92% less likely to use LLINs than those with adolescents sleeping alone respectively(15).

2.2.3. **LLIN related factors**

Having more number of LLIN has significant association with utilization. Households that have one freely acquired LLIN were 1.22 times more unlikely to use it compared to those that have more than one .Similarly another study conducted in Southern Ethiopia, revealed that possession of two or more LLINs by households have 2.03 times more likely utilization compared to those having less than two LLIN (18). Similar studies in Western Ethiopia showed households with two or more LLINs were 4.77 and 4.65 times more likely utilization compared to those having only one respectively (15).

A community based cross sectional study in North western Ethiopia, revealed that 58% less utilization of average number of LLIN and those households believing LLIN should be treated are 2.9 times high odd of utilization compared to their counterpart (12) .

Feeling comfortable with LLIN have more chance of utilization compared to those who do not feel comfortable with LLIN.A study in Gambela Western Ethiopia shown that households who felt comfortable with LLIN for family sleeping habit were 4.55 times more likely to use it than their counterparts (15).

Conceptual framework

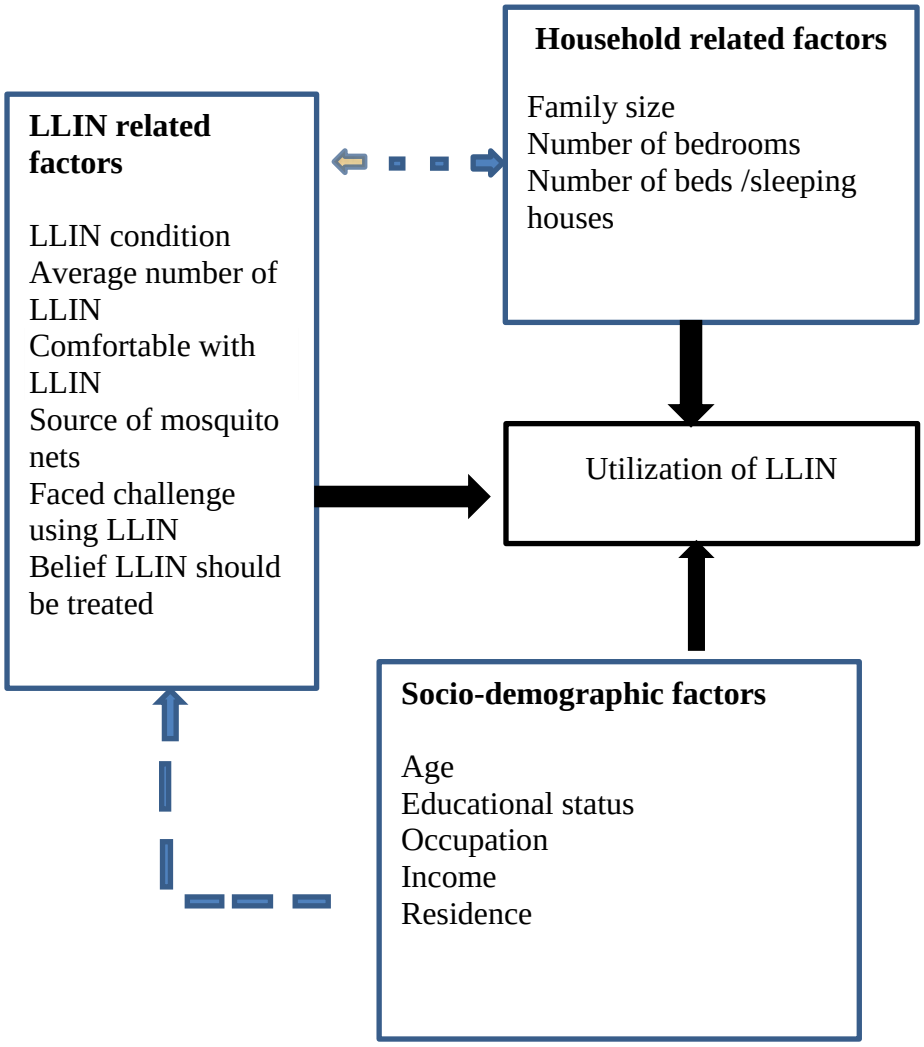

Figure 1 conceptual framework adapted from different literatures for factors associated with utilization of long lasting insecticidal n nets(4,7,8,9,10,11,12,13,14,15,16,17,18)

3. Objectives

3.1. General objectives

To assess the prevalence of long lasting insecticidal nets utilization and associated factors in Boricha and Bilate Zuria Woreda, Sidama Region, Southern Ethiopia ,2023.

3.2. Specific objectives

1. To determine the prevalence of utilization of long lasting insecticidal nets in Boricha and Bilate Zuria Woreda from February 2023 to March 2023.

2. To identify factors associated with utilization of LLIN in Boricha and Bilate Zuria Woreda from February 2023 to March 2023.

4. Methods

4.1. Study Setting

The study was conducted in the Sidama Regional State in Southern Ethiopia, in two districts namely Boricha and Bilate Zuria.In Ethiopia, a district (called woreda) is divided into *kebeles*, which is the lowest administrative unit of the country. Boricha district has 14 *kebeles* and Bilate Zuria district has 18 *kebeles*.

The estimated total population of the Boricha district is 101,250 and it is 147,084 for Bilate Zuria district in 2021. The elevation of the study area ranges from 1643 to 2061 m above sea level. The mean annual rainfall of the two districts ranges from 801 to 1000 mm, and the mean annual temperature ranges from 17.6 to 22.5 °C. Most of the population lives in rural areas. Malaria is among the leading causes of illness in the districts**.**

4.2. Study Design and period

A community-based cross-sectional study was conducted to assess the utilization of LLINs and associated factors.The study period is from February 2023 to March 2023

4.3. Population

4.3.1. Source population

All households in Boricha and Bilate Zuria districts during the study period were source population.

4.3.2. Study population

Nine malaria endemic rural *kebeles* were included in the study. Four of the *kebeles* are from Boricha district and five are from Bilate Zuria district. These *were* selected based on their history of random selection for evaluation of child and maternal malnutrition in 2017. The study population was households found in randomly selected health development teams in the nine kebeles after multistage sampling.

4.4. Inclusion and exclusion criteria

4.4.1. Inclusion criteria

Heads in selected households or any member of the household who were residents of Bilate Zuria Woreda and Boricha Woreda and who are aged over 18 years who could provide credible information was included in this study.

4.4.2. Exclusion criteria

Household heads and persons severely sick, unable to respond, or not available in their homes for three consecutive visits plus one more final visit at the end of the data-collection period were excluded from this study.

4.5. Sample size determination, sampling technique and procedure

4.5.1. Sample size determination

The sample size for prevalence of LLIN utilization in Bilate and Boricha Zuria Woreda was calculated using open source software for epidemiologic statistics (open epi) version 4.01. Using open epi the sample size determined was 726. by considering the following assumptions; prevalence of LLIN utilization in previous studies in Wonago Woreda ,Southern Ethiopia was 68.8%, level of confidence 95%, margin of error 5%, 10% non-response rate, and design effect of 2 (18).

The sample size for objective two was calculated based on the assumption below. Confidence interval of 95%, power of 80%, ratio of exposed to non-exposed 1:1 and by taking adjusted odds ratio, percent of outcome in unexposed group and exposed from previous studies. In order to calculate the sample size the variables number of LLIN in the household, educational level and occupation was taken from previous studies conducted in Ethiopia .Finally the variable that gave the largest sample was taken as the optimal sample size of the study.

Among the variables number of LLIN in the house hold was taken as the main exposure variable for factors associated with the utilization of LLIN. Finally by adding 10% of non-response rate the final sample size was 399 the sample size was determined as shown below.

Table 1 sample size determination for factors associated with utilization of LLIN in Boricha and Bilate Zuria Woreda

Variables	Percent of outcome in unexposed group	Percent of outcome in exposed group	Adjusted odds ratio	Total sample size	Reference
Number of LLIN in the household	66.94%	80%	2.03	399	(18)
Educational level	26%	61%	4.4	82	(14)
Farmer	61.45	78%	2.262	280	(13)

4.5.2. **Sampling technique and procedure**

A multi-stage sampling technique with two stages were used to select study participants for LLIN utilization studies. The primary sampling units were kebeles and the secondary sampling unit households. Proportional sample size allocation done to find number of households to be included in the study based on recent demographic data of households and population from each kebele. To select allocated sample size from each kebele, we used cluster sampling technique after creating sampling frame for each kebele.

clusters are health development teams (HDTs). HDT is a structure within a small geographical area that contains approximately 30 households and 150 inhabitants. There are a total of 492 HDTs in the selected nine kebeles. From each kebele's the required number of clusters was selected using simple random sampling technique. Households which found in selected health development were included in the study.

Table 2 Population profile of the selected kebeles in the Boricha and Bilate Zuria districts

S. No	Name of District	Name of Kebele	# of HHs/ kebele	# of Pop/ kebele	Selected # of HHs/ kebele	Selected # of clusters (HDTs)/ kebele
1	Boricha	Sadamo Dikicha	1680	8400	83	3
2	Boricha	Alawo Siso	1410	7050	69	2
3	Boricha	Fulasa Aldaada	1530	7650	75	6
4	Boricha	Aldaada Deela	1230	6150	61	3
5	Bilate Zuria	Qonsore haranja	1226	6006	60	2
6	Bilate Zuria	Kitawo Dambie	2328	11407	115	4
7	Bilate Zuria	Sadamo Challa	1767	8660	87	3
8	Bilate Zuria	Hanja Gooro	1990	9751	98	3
9	Bilate Zuria	Gonowa Bulano	1583	7758	78	3
Total			**14,744**	**72,832**	**726**	**29**

The data collectors then went from home to home and checked for the presence of eligible study participants in all households in each cluster. Thereafter, all eligible participants was provided information regarding the basic elements of informed consent and then requested to offer their consent for participation. After having a written informed consent, the data collectors performed two consecutive tasks—face to face interviews and direct observation for LLIN utilization.

The same procedure was undertaken by all data collectors for all eligible participants in the households within the selected clusters of a district. Upon the presence of two or more eligible participants in a household, one of them was selected randomly.

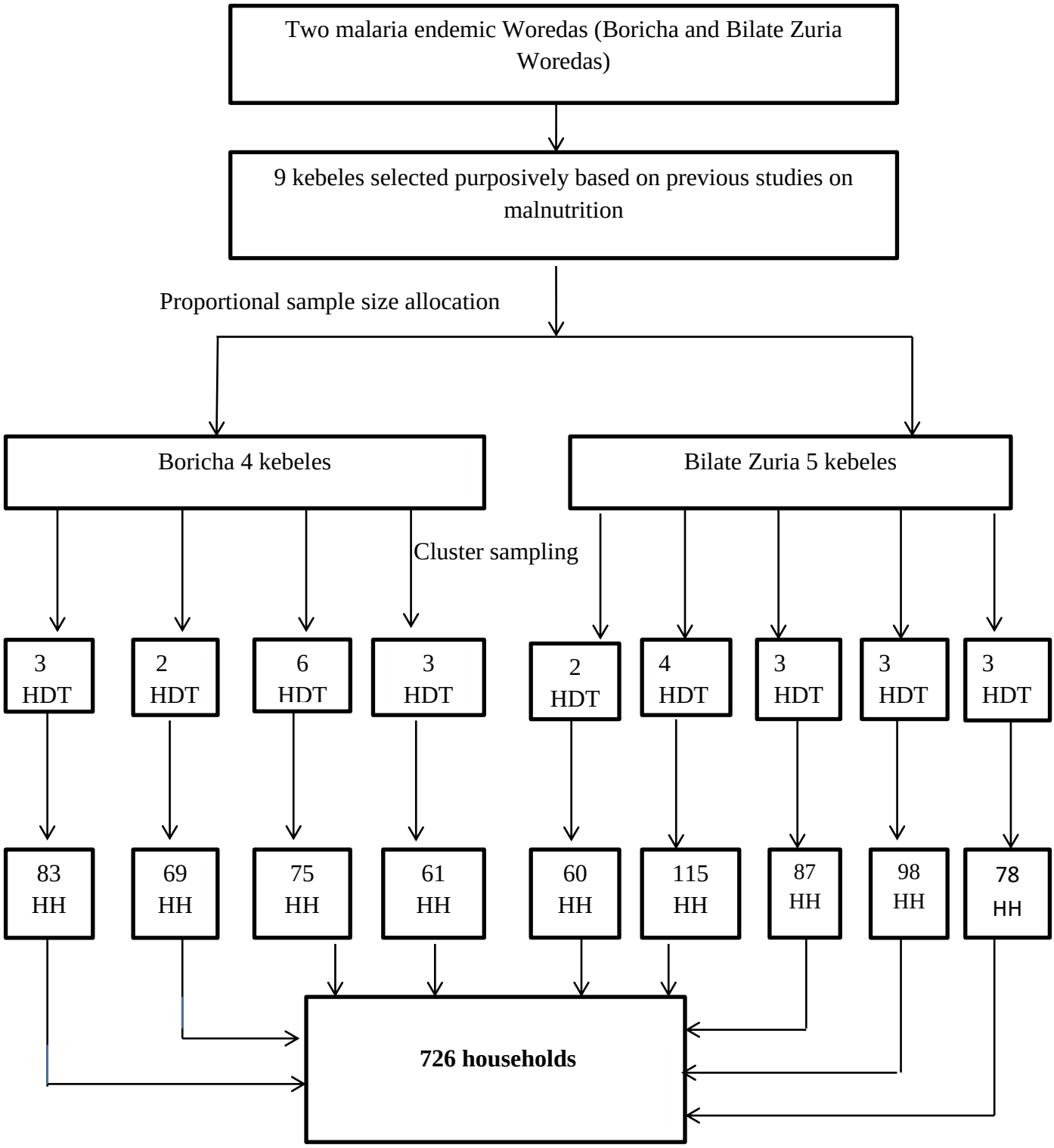

Figure 2Diagrammatic presentation of sampling and final sample size

4.6. Variables of the study

4.6.1. Dependent variables

The dependent variable for this study is LLIN utilization which is dichotomized as “Yes” coded to be “1” and “No” coded to be 0.

4.6.2. Independent variable

Independent variables categorized as

1.Socioeconomic

- Age
- Educational status
- Occupation
- Income
- Residence

2. Household related

- Number of LLIN in the house hold
- Family size
- Number of bed rooms
- Number of beds

3.LLIN-related factors.

- LLIN condition
- Average number of LLIN
- Comfortable with LLIN
- Source of mosquito net
- Faced challenge using LLIN
- Belief LLIN should be treated

Variables used in this study are defined operationally to make them measurable:

• **Utilization of LLIN**– refers to HHs that owned an LLIN in which one or more members of the House hold slept under a net, reportedly or confirmed through observation by enumerators during the early morning preceding this study.

4.7. Data collection tools, methods and procedures

Data was collected using pretested and structured questionnaire, which is adapted from related literature through face to face interview. In addition, an observational checklist was used to check if the net has been hung over the bed or sleeping place. Seven unemployed graduates were recruited for the data collection process. These included six diploma clinical nurses for data collection and one public health professional for supervision (21).

One-day training was provided before the actual data collection commencement. Data collectors were supervised every day and samples of respondents were re-interviewed and the results were then cross-checked. The questionnaires were first prepared in English, then translated into Sidaamu afoo (local) language and finally back to English. Each data collector checked the questionnaires for completeness before leaving each study participant. Each questionnaire was reviewed daily for completeness and clarity (21).

4.8. Data processing and analysis

Data was checked, coded and entered into EpiData version 3.1. Data was exported to SPSS version 20 for analysis. Both descriptive and analytical statistical procedures were done and results were presented using tables and texts. Binary logistic regression model was used to identify factors associated with LLIN utilization. Both bivariate and multivariable logistic regression analyses were carried out. All the variables showing association in the crude analyses were included in the adjusted analyses (21) .

Both COR and AOR with the corresponding 95% CI were computed. Finally, the level of significance was declared based on AOR with its 95% CI and P-value≤ 0.05. Model fitness was checked using Hosmer and Lemeshow goodness of fit test (21).

4.9. Operational definition

LLIN utilization was measured based on respondents' self-report together with direct observation. Accordingly, LLIN utilization were recorded to be "Yes" if the respondent reported the family slept under LLIN during the night prior to the survey date and LLIN was observed to be hanged (mounted) over the bed/the sleeping area during the observation day.

On the other hand, LLIN utilization was labeled to be "No" if the respondent reported the family did not slept under LLIN during the night prior to the survey date or if the LLIN was not observed to be hanged (mounted) over the bed/the sleeping area during the observation day despite a positive participant's report (21).

4.10. Ethical considerations

Ethical approval was secured from the Institutional Review Board of Hawassa University College of Health Sciences School of Public Health Ref.No IRB/260/15. Then, further consent was obtained from Sidama Region public Health institute, Boricha and Bilate Zuria Woreda health office based on the hierarchy of the authority of the offices. Written informed consent was obtained from each study participant.

5. Results

5.1 **Socio demographic characteristics**

A total of 726 respondents were included in the study yielding a response rate of 100%. The majority of the heads of the households were males (654; 90.1%). 199 (27.4%) of the participants were in the age group of 31-40 -year-old with the mean± standard deviation (SD) of 43.1± 13.98.

A majority 673 (92.7%) of the respondents were married. About 616 (84.8%) of the participants were protestant religious followers and 713 (98.2%) of the respondents were Sidama by ethnicity.

About 402(55.4%) of the participants cannot read and write and 462 (63.6%) of the respondents were farmers by occupation. Regarding the household's characteristics, about 394 (54.3%) of the households sheltered more than five family members.

636 (87.6%) of the households' roof was thatched/leaf. three hundred and sixty-nine (50.8%) of the households had at least two sleeping rooms with the mean number (± SD) of rooms per household of 1.74 (± 0.667)

Table 3 Socio demographic and household characteristics of the respondents in Boricha and Bilate zuria woreda, Sidama, 2023

Variables	Frequency	percent
Age(years)		
<=30	187	25.8
31-40	199	27.4
41-50	163	22.5
51+	177	24.4
Marital status		
Married	673	92.7
Living together	7	1.0
Divorced or separated	1	0.1
Widowed	45	6.2
Head religion		
Protestant	616	84.8
Orthodox	1	.1
Muslim	22	3.0
Catholic	70	9.6
Others	17	2.3
Head educational status		
Can't read and write	402	55.4
Read and write	109	15.0
Primary (1-8)	137	18.9
Secondary (9-12)	51	7.0
Certificate and above	27	3.7
Head occupation		
Farmer	462	63.6
Non farmers	264	36.36
Family size		
<=4	332	45.7
5+	394	54.3
Main material of the roof		
Thatch/Leaf	636	87.6
Corrugated Iron	78	10.7
Other	12	1.7
rooms for sleeping		
1	276	38.0
2	369	50.8
>=3	81	11.2

5.2. **Long lasting insecticidal net utilization**

640(88.2) of households own LLIN. From these 547(85.5%) of the households are utilizing LLIN. And About 201 (31.4%), and 439 (68.6%) of the households had only one and >=two LLIN, respectively.

Table 4 House hold ownership and utilization of LLIN

Variable	number	Percent
Ownership of LLIN		
Yes	640	88.2
No	86	11.8
No of nets owned by HH		
1	201	31.4
>=2	439	68.6
Sleeping under LLIN		
Yes	547	85.5
No	93	14.5

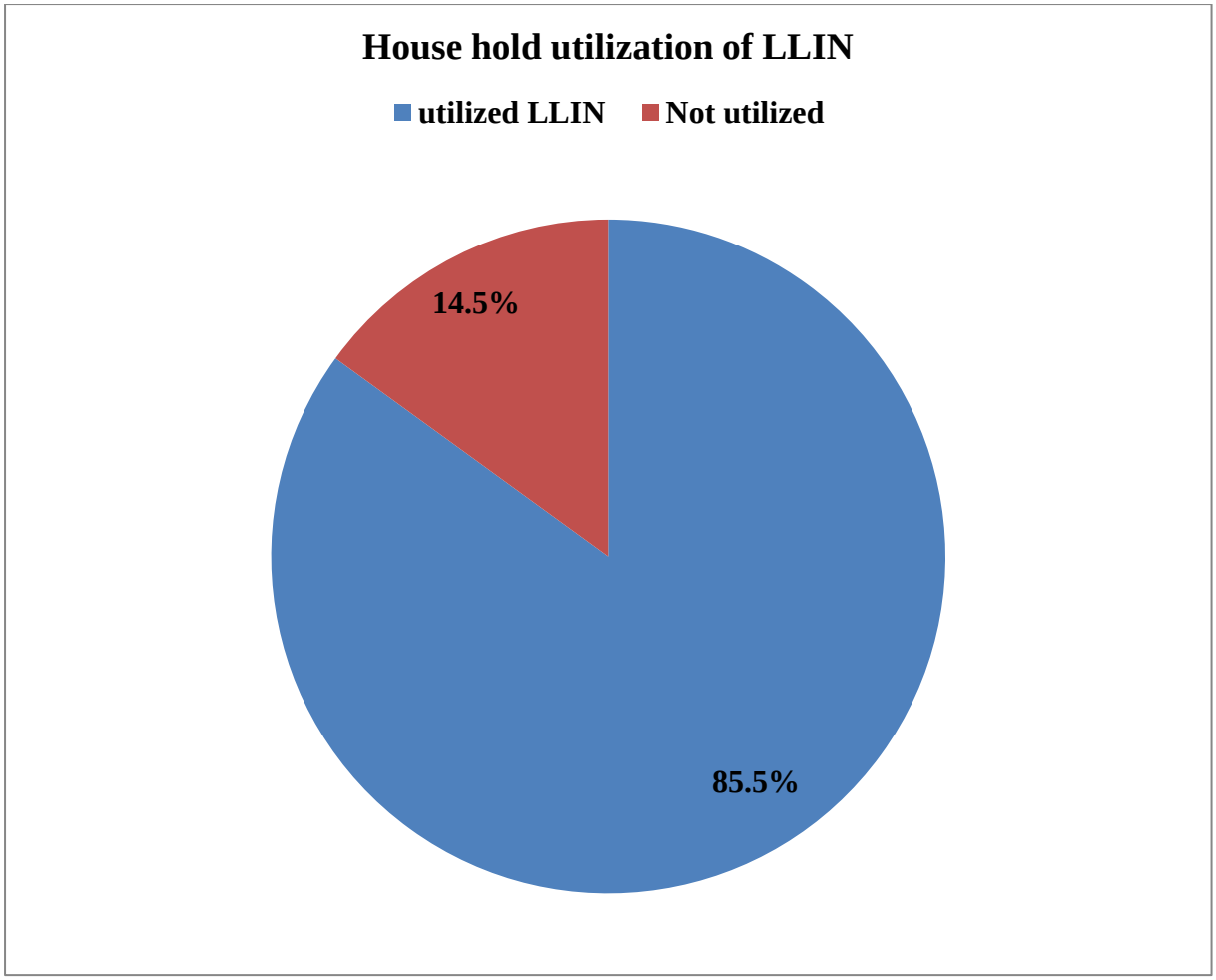

Figure 3 house hold utilization of LLIN

5.3. **Factors associated with LLIN utilization**

Based on bi-variable analysis households having mobile telephone, bed, family size and number of LLIN. All of them were selected for inclusion in to multivariable analysis using a p-value cut-off of 0.25. In the multivariate family size and number of LLIN in the household were significantly associated with utilization of LLIN with p-value <0.05.

The multivariable logistic regression analysis result showed that the odds of LLIN utilization among households having family size of less than 5 persons (AOR= 0.60; 95% CI 0.37, 0.96) are 40% less chance of utilization of LLIN compared to those households having 5 and more persons.

Households having one LLIN (AOR= 3.55; 95% CI of (1.92, 6.57) are 3.55 times more chance of utilizing ITN compared to households having three and more ITN.

Table 5 Factors associated with LLIN utilization in Boricha and Bilate Woreda, Sidama Ethiopia, 2023

Variable	**LLIN utilization**		**COR(95%CI)**	**AOR(95%CI)**
	yes	**No**		
Mobile				
Yes	279	37	1.57(1.00, 2.46)	
No	268	56		
Bed				
Yes	274	39	1.38(0.46, 1,12)	
No	273	54		
Family size				
<5	245	49	0.73(0.47-1.13)	0.60(0.37-0.96)*
>=5	302	44	1	
Number of mosquito net				
One	187	14	2.93(1.61-5.31)	3.55(1.92-6.57)*
>=two	360	79	1	

- Note *Variables that have significant association with utilization in multiple analysis

6. Discussion

This study was conducted to assess the prevalence and associated factors of LLIN utilization in Boricha and Bilate Zuria Woreda. The prevalence of LLIN utilization was 85.5% and independently predicted by number of mosquito nets and family size.

The proportion of people utilizing LLIN is similar with studies done in Southern Ethiopia which was 85.1% (17).However higher than the studies done in Democratic Republic of Congo 78.4% (11). The possible explanation for the difference was study time difference, study people and sample size. The study in Congo was done in 2017, conducted on pregnant women and guardians of children under five years and also the sample size was much higher than our studies which was 5138.

There were also a difference with the study done in Uganda which was 54.4%(10). This study used small sample size. There were also study time and study design difference with study conducted in North Central Nigeria 33.6% (9). Which was done in 2010 and used mixed study design.

There were also a difference with study conducted in Wonago 68.8% (18). There were a difference in study time and sample size .In this study the study time was in 2006 and the sample size used was 650 households .

The proportion of participants owing LLIN in the current study is higher. For example, about 88.2% of respondents in the current study owned at least one LLIN. In this perspective, existing evidence suggest that higher LLIN ownerships coverage is directly proportional to better LLIN utilization in a given area.Moreover, the higher LLIN utilization in the current study could be partly explained through the fact that the distribution of LLIN was done one month before the conduction of the study .

House holds which have less than five family size are 40% less chance of utilizing LLIN compared to those counter parts which have more than five family .This finding is opposite to the findings in Gambella Western Ethiopia,which shown house holds having high family size were not utilizing the freely acquired LLINS (15).one possible explanation of the difference may be issuance of more LLIN to a large family without sensitization campaign.(family size)

Households having one LLIN are 3.55 times more chance of utilizing the available LLIN compared to those households having two and above LLIN.This finding is opposite to that of North West Nigeria where lower household number of LLIN was associated with non-utilization also opposite with a study conducted in Southern Ethiopia, which revealed that possession of two or more LLINs by households have 2.03 times more likely utilization compared to those having less than two LLIN (18).

Similar studies in Western Ethiopia showed households with two or more LLINs were 4.77 and 4.65 times more likely utilization compared to those having only one respectively (15). One possible explanation for this is that households having more than one LLIN embeds and plans to use for other time.

The issuance of more LLIN to a large family with the absence of a sensitization campaign may likely underplay the important role of the LLIN in the minds of the recipients, thereby resulting in non-utilization. However, there is a need for caution against drawing causality as this study was cross-sectional in nature.

7. Limitation of the study

One limitation of the study is that it assessed utilization of LLIN for a limited short period of time: night before the survey. By so doing, it excludes regular users of LLIN who only happen not to use it the night before the survey. It might overestimate the proportion of utilization of LLIN.

8. Conclusion

Percentage of long-lasting insecticide-treated nets (LLINs) that were used by anyone the night before the study was high compared to the national 62.3% according to malaria indicator survey of 2015. It was significantly associated with number of LLIN and family size.

The finding of this study concluded that households having low family size were associated positively with utilization .But having more LLIN in the household does not secured utilization because those households having more LLIN were not utilizing when compared with those having only one.

9. Recommendation

Woreda Health Offices

The delivery of LLIN should be based on the number of family sizes residing in the houses.

There must be a sensitization campaign done before issuance of LLIN.

The delivery of LLIN should be secured for all households who donot have LLIN.

Health extension workers

There must be continuous education of the people not to use the additional LLIN for non-intended purposes.

Researchers

Future studies should be carried out using mixed methods to know some barriers associated with utilization

References

1. HARRISON'S 18.
2. Solomon T, Loha E, Deressa W, Balkew M, Gari T, Overgaard HJ. Bed nets used to protect against malaria do not last long in a semi - arid area of Ethiopia : a cohort study. Malar J [Internet]. 2018;1–15. Available from: https://doi.org/10.1186/s12936-018-2391-5
3. Ababa A. Ethiopia malaria elimination strategic plan: 2021-2025. 2021;(August 2020):2021–5.
4. Brief A. Malaria prevention through insecticide treated nets. 2016;(April).
5. World Health Organization. World Malaria Report. Vol. WHO/HTM/GM, World Health. 2022. 238 p.
6. Yitayew AE, Enyew HD, Goshu YA. Utilization and Associated Factors of Insecticide Treated Bed Net among Pregnant Women Attending Antenatal Clinic of Addis Zemen Hospital, North-Western Ethiopia: An Institutional Based Study. Malar Res Treat. 2018;2018.
7. Biadgilign S, Reda A, Kedir H. Determinants of ownership and utilization of insecticide-treated bed nets for malaria control in Eastern Ethiopia. J Trop Med. 2012;2012.
8. Alemu MB, Asnake MA, Lemma MY, Melak MF, Yenit MK. Utilization of insecticide treated bed net and associated factors among households of Kola Diba town, North Gondar, Amhara region, Ethiopia. BMC Res Notes [Internet]. 2018;11(1):1–5. Available from: https://doi.org/10.1186/s13104-018-3697-7
9. Jombo GTA, Mbaawuaga EM, Gyuse AN, Enenebeaku MNO, Okwori EE, Peters EJ, et al. Socio-cultural factors influencing insecticide treated bed net utilization in a malaria endemic city in north-central Nigeria. Asian Pac J Trop Med. 2010;3(5):402–6.
10. District-uganda K, District-uganda TC. Treated Nets among Residents of Kamwenge. 2019;19(2).
11. Inungu JN, Ankiba N, Minelli M, Mumford V, Bolekela D, Mukoso B, et al. Use of insecticide-treated mosquito net among pregnant women and guardians of children under five in the democratic republic of the Congo. Malar Res Treat. 2017;2017.
12. Gumuz B, Duguma A, Woldemichael K, Dejene ; Tariku, Agajie ; Mulatu, Bureau H, et al. Assessment of Insecticide Treated Bed Net Use and Factors Affecting Its Use For Prevention of Malaria Among Pawe Woreda Community, Benishangul Gumuz, North-West, Ethiopia. Mulatu Agajie [Internet]. 2018;6(9):13–22. Available from: www.ijournals.in
13. Teklemariam Z, Awoke A, Dessie Y, Weldegebreal F. Ownership and utilization of insecticide-treated nets (ITNs) for malaria control in Harari National Regional State, Eastern Ethiopia. Pan Afr Med J. 2015;21:1–9.
14. Nesga D, Abate D, Birhanu G, Addissie A. Assessment of Malaria Vector Control Measures (ITNs & IRS) Utilization and Factors Affecting it in Adama District, East Shoa Zone, Oromia Region Ethiopia, 2018. J Fam Med Heal Care. 2020;6(2):46.
15. Watiro AH, Awoke W. Insecticide-treated net ownership and utilization and factors that influence their use in Itang, Gambella region, Ethiopia: Cross-sectional study. Risk Manag Healthc Policy. 2016;9:101–12.
16. Astatkie A, Feleke A. Utilization of insecticide treated nets in Arbaminch Town and the malarious villages of Arbaminch Zuria District, southern Ethiopia. Ethiop J Heal Dev. 2010;24(1):15–24.

17. Admasie A, Zemba A, Paulos W. Insecticide-Treated Nets Utilization and Associated Factors among under-5 Years Old Children in Mirab-Abaya District, Gamo-Gofa Zone, Ethiopia. Front Public Heal. 2018;6(February):1–7.
18. Dagne G, Deressa W. Knowledge and utilization of insecticide treated mosquito nets among freely supplied households in Wonago Woreda, Souther Ethiopia. Vol. 22, Ethiopian Journal of Health Development. 2008.
19. Gobir AA, Sambo MN, Hadejia SI. Factors Associated with Non-utilization of Freely Acquired Insecticide-treated Nets (ITNs) in a Rural Agrarian Community of North-Western Nigeria. J Sains Kesihat Malaysia. 2013;11(2):63–9.
20. Tassew A, Hopkins R, Deressa W. Factors influencing the ownership and utilization of long-lasting insecticidal nets for malaria prevention in Ethiopia. Malar J. 2017;16(1):1–9.
21. Yirsaw AN, Gebremariam RB, Getnet WA, Mihret MS. Insecticide-treated net utilization and associated factors among pregnant women and under-five children in East Belessa District, Northwest Ethiopia: using the Health Belief model. Malar J. 2021;20(1):1–12.

ANNEX

Annex1: data abstraction form

INFORMATION SHEET

Name of the Institute_____

Address of the Institute_____

Greeting:

Hello, how are you?

My name is…… I am data collector on behalf of a Masters Student in Hawassa University College of medicine and health science school of graduate studies, who want to conduct this study.

Title

Utilization of long lasting insecticidal nets and associated factors in Boricha and Bilate Zuria district Sidama region, Southern Ethiopia, 2023

Objective/aim of the study

To assess utilization of long lasting insecticidal nets and associated factors in Boricha and Bilate Zuria Woredas, Sidama region, Southern Ethiopia, 2023:

Confidentiality

Your name will not be written in the form and I assure you that all information that you give will be kept strictly confidential.

Right of participants

Your participation is voluntary and you are not obliged to answer any question you do not wish to answer. If you are not still comfortable with interview, please be free to stop me any time you like

Benefit and risk in participating into the study

Study cooperation and willingness for the interview is very crucial in identifying the problems related to the issue. There is no harm if you not answer the questions and no special benefit you get if you answer the question the interview will take 20- 25 minutes. We would be thankful if you spend some time with us answering questions related to the issues described above. There is no special payment for you by participating into the study. For more information and question the address of investigator:

Investigator- Mesele Alaro

Address- Hawassa University College of medicine and health science school of public health

Mobile- 0901551585/0704522156

E-mail- **missalekeariam123@gmail.com**

DECLARATION OF INFORMED VOLUNTRY CONSENT

I have heard/ was read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risk and benefit, issue of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask question for things that may have been unclear. I was informed that I have the right to withdraw from the study at any time or not to answer any question that i do not want. Therefore, I declare my voluntary consent to participate in this study with my signature as indicated below.

Name of participant ---------- Signature----------

Name of data collector ---------- Signature----------

Annex 2: Data collection tools

Questionnaire to conduct census on selected socio-demographic variables and to gather data on malaria prevention.

General Information		
GI1	Household number	_____
GI2	Site in which the interview is being conducted	a) Kebele _____b)Zone_____ _____ c)HDT _____
GI3	Personnel (name and signature)	a) Interviewer_____ ____ b) Supervisor_____
GI4	Date of visit	[_____|_____| _____|

Introduction and Consent

My name is_____ and I'm working for Hawassa University. We are conducting a survey about malaria in collaboration with the Woreda Health Office. We would very much appreciate your participation in this survey. This information will help the Sidama Regional Health Bureau to plan health services. This interview could take less than 15 minutes to complete. Whatever information you provide will be kept strictly confidential and will not be shown to other persons. Participation in this survey is voluntary and you can choose not to answer any individual questions or all of the questions. However, we hope that you will participate fully in this survey since your views are important. There will be quarterly visit for the next 1 year.

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

Written consent given to interview, check box ☐

Section one: Socio demographic characteristics of respondents in Boricha and Bilate zuria woredas

Q1	Sex	1. Male 2. Female		
Q2	Age of respondent	_____		
Q3	Relationship	1. Head 2. wife/husband		
Q4	Educational status	1.illitrate 2.read and write 3.grade 1-8 4.grade 9-12 5college/university		
Q5.	Marital status	1.married 2.single 3.divorced/separated 4.widowed		
Q6.	Occupation	1.house wife 2.civil servant 3.student 4.farmer 5.trader 6.others(specify)		
Q7.	Ethnicity	1.sidama 2.oromo 3.amhara 4.gurage 5.other(specify)		
Q8.	Religion	1.protestant 2.catholic 3.orthodox 4.muslim 5.other(specify)		
Q9.	Family size	_____		
Q10.	Family income	_____		
Q11.	Place of residence	1.urban 2.rural		

Section 2.Housing condition of Boricha and Bilate Zuria Woredas in 2023

Q103	Type of housing construction	corrugated iron sheet……1 thatched/plastic roof…….2	
Q104	Do you have a separate bed room	Yes…… ……1 No…… ….2	
Q105	How many rooms in this household are used for sleeping?	Number of rooms[__|__]	
Q107	Family shares one bed	yes……..1 no …….2	
Q108	How many sleeping spaces such as mats, rugs, mattresses or beds are used in this household?	_____	

Section 3: Malaria prevention and treatment (long lasting insecticidal net possession and utilization of Boricha and Bilate Zuria Woredas				
Q1.	Does your household have any mosquito net that can be used while sleeping	Yes…….1 No ……2		
Q2.	How many mosquito nets do your house hold have	_____		
Q3.	Ask the respondent to show you the net in the house hold	Net# 1 Observed….1 Not observed….2	Net #2 Observed….1 Not observed…..2	Net #3 Observed….1 Not observed….2
Q4.	How long ago did your household obtain mosquito net	-----,-----months ago	-------months ago	-------months ago
Q5.	Where did you obtain the net	Government Clinic/hospital Health extension worker……. 1 Retail shop Pharmacy……. 2 Workplace…… 3 Other (specify)_____...	Government Clinic/hospital Health extension worker……. 1 Retail shop Pharmacy……. 2 Workplace…… 3 Other (specify)_____...	Government Clinic/hospital Health extension worker……. 1 Retail shop Pharmacy……. 2 Workplace…… 3 Other (specify)_____...

		..4 Don‘t know……………..98	..4 Don‘t know……………..98	..4 Don‘t know……………..98
Q6.	Did you purchase the net	YES............1 NO..............2 Not sure............ 8	YES............1 NO..............2 Not sure............ 8	YES............1 NO..............2 Not sure............ 8
Q7.	How much did you pay	-----------birr	------------birr	------------**birr**
Q8.	Did anyone slept under the mosquito net last night	Yes……………1 No...…………...2 Not sure………8	Yes……………1 No...…………...2 Not sure………8	Yes……………1 No...…………...2 Not sure………8
Q9.	Who slept under this mosquito net			
Q10.	Why did no one slept under this mosquito net	No malaria………….. 1 No nuisance/insects… 2 No space for net ……….3 Irritation ………………4 Suffocation / too hot ….5 Difficult hanging net ….6 Shape ………………..7 Absence from home …..8 Other......................... 9 Don‘t know……....98	No malaria………….. 1 No nuisance/insects… 2 No space for net ……….3 Irritation ………………4 Suffocation / too hot ….5 Difficult hanging net ….6 Shape ………………..7 Absence from home …..8 Other......................... 9 Don‘t know……....98	No malaria………….. 1 No nuisance/insects… 2 No space for net ……….3 Irritation ………………4 Suffocation / too hot ….5 Difficult hanging net ….6 Shape ………………..7 Absence from home …..8 Other......................... 9 Don‘t know……....98
Q11.	At any time in the past 12 months have the walls in your dwelling been plastered or painted	Yes...........................1 No............................2		
Q12.	How many			

	months ago were the walls plastered or painted if less than one month record 0	Months----------		

Section 4.Communication related quastions of Boricha and Bilate zuria woreda,2023

Q1.	have functional radio	1.Yes 2.No		
Q2.	got information about malaria in past one year	1.Yes 2.No		

Tini Borri-Xa'mo Shiqqannohu Dooramino Darga Shekkeerete Xisso Gargarooshshenna Xagishshi Mannoomittetenna Dagoomittete Heeshshote Rosichi Aanaati

Xaphoomu Taje		
GI1	Mini maate kiirotenni	_____
GI2	Xa'minoonni baycho	a) Ollaa _____b)Zoone_____ _____ c)Fayyimmate olanto gaamo _____
GI3	Xa'maanchunna qorqoraanchu su'ma :malaate	a) Xa'manchu su'manna malaate_____ _ b) Qorqqoraanchu su'manna malaate_____
GI4	Towanyote barra	[_____|_____| _____| barra | agana | diro

Bitimanna Fajjo

Su'ma'ya _____ yinannie. Ani looseemmohu Hawaasi yuniveristeraati . Ninke assinemo laooshshi mini-wiliilchunna woradu fayyimmate biiro waaxo xiinxallateeti. Beeqqo assitinannihura addintanni galanteemmo'ne ! Uytinanninke taje Sidaaamu Dagoomu Qoqqowu Mootimma fayyimmate mixo owaantera fakkana kaa'lo uytanno. Tini qaali-xa'mo keeshshitannohu 15 xiqqeessaati. Uytinanninke taje fojo wolu mannira dihasaambanni/ dikullanni. Beeqqo assattohuno/ahuno meessikki fajjonniiti. Ikkollana, laooshshikki dancha ikkiro, beeqqo asssatto/a gede hexxo'yaati. Aanino diri bocu-boci diri giddo towaanyo heedhanno.

Tenne xiinxallora xa'mo noohe? Xa'mo hanafo

Borrote fajjo anga'nera oommo

Gafa 1: Mini Maate Su'mi Tittironna Dagoomi-Miinju Akata

Q1	Koo/tee	1. koo 2. Tee	
Q2	Diro		
Q3	Minu anni ledo no fixooma	1. anna/ama 2.Galte/gashshaanna 3. Qaaqqo 4. fiixa 5.soqqantannota; 6. wole	
Q4	Rosu deerra	• Rosinokkiho • RW= Nabbawanna borreessa dandiinoho • Rosinoha ikkiro ,lowiidi rosu deerra borreessi	
Q5.	Adhaa-mate dana	1. Adhaminoho 2. Mitteenni he'ranno 3. Tidhaminoho woy baxxinoho 4. Shiidhinote 5.Adhaminokkiho/mitteenni hee'ranokkiho	
Q6.	Loosu dana	Qaxaraminoha 2. Minu ama 3 Baatto loosi're galinoha 4. Barru loosaasincho 5. Daddalaancho 6. Rosaanchoho 7. No job/dependent	
Q7.	Hiikko ayiddeeti	Sidaama 2. Oromo 2. Amaara 3. Guraage 4. Wole xawisi _____	
Q8.	Ama'nokki?	Pirotestante 2. Ortodokisse 3. Isilaama 4. Wole xawis	

Q103	Mini'ne maatera no? Korreente Girgiddu saate Raadoone Televizhiine Mobayile(kiisete bilbili) Mini bilbili Qiissancho? Xarapheezzu? Barcimu ? Daallasu? Korreentete loossanno mixashsho? Kurraaze/maasho	1 Ee 2 Dee'ni Korreente-----1 2 Girgiddu saate ----------1 2 Raadoone---------- -1 2 Televizhiine ---------- 1 2 Mobayile(kiisette bilbili)--1 2 Mini bilbili----------1 2 Qiissaancho?----------1 2 Xarapheezzu? ----------1 2 barcima ----------1 2 Daallasu? ----------1 2 Korreentete loossanno mixashsho 1 2 Kurraaze …….1 2	
Q104	Sagale qishi'nanni addi kifile noo'ne?	Ee……1 Dee'ni…….2	
Q105	Mini uullaydo mayinni loonsoonni? ***(Laoottore wonshi)***	Bushshunni/obbunni……...1 shakilunni…….……2 Simintote…….. . . .. . .3 wole……. 96 _	
Q106	Mini fukko mayyini loonsonni? ***(Laoottore wonshi)***	hayisso/darote……1 Qorqorote. . . . . ……... ……..2 simintote. . . . . ……... . . . . 3 wole…….…… ..96 (xawisi)_____	
Q107	Mineho gobbaydi girgidda mayinni loonsoonni? ***(Laoottore wonshi)***	Girgiddu dinooho……..1 Haqqeete…….2 Haqqetenna sabbunni…….3 Haqqetenni,sabbunninna simintotenni……..4 Bilokeettete…… Wole----------5 …….……..96 (xawisi)_____	
Q108	Me''e kifile noo'ne gonxanniti mini'ne maatera ?	Kifile kiirotenni wori[__|__]	
Q109	Meu gonxanni baychi noo'ne daddo,madawe/shara /daallassa kadhate gonxanni baychi noo'ne?		
Q11	Maate'ne giddo kuriuu noohu no?:		

0	Shalleette? xexxersa? Gaare…? Kaameella?	Ee Dee'ni shalleette….1 2 xexxersa……1 2 Gaare……..…….1 2 Kaameella……..1 2	
Q111	Maate'nera baatto loossidhinanniti noo'ne?	Ee……1 Dee'ni…….2→	**Sai xa'mo X113**
Q112	Maate'ne loosidhe hedhanno baatto me''ete?Qarqaru kiironni? ***(anfoonnikkiha ikkiro 98 kiiro borreessi.***	Qarqaru bikkinni [___|___] xawisi_____	
Q113	Mini'ne maatera lalu,hoshsha/ce'inoonni saada no?	Ee……1 Dee'ni…….2	
Q114	Maate'nera me''e saada noo'ne umi'neti? Adote saada, handa, /aja bootta farado, harre, gaango? Meu? Ge'reewo? lukkuwa? ***(anfoonnikki ikkiro 98 kiiro borreessi)***	Adote saada, haanda, /aja bootta------ farado, harre, gaango---- Meu---------- Ge'reewo---------- lukkuwa----------	
Q115	Maate'ne giddo woxe suuqidhinanni baankete/maykiro fayinanse kiiro noo'ne?	Ee……1 Dee'ni…….2	
Q116	Mini'ne maate duucha wote agate horoonsidhinanni way hiikkiinniiti? ***(Dawaro horonta nabbabbooti)***	Meessiha baambu waa xorshi'rate …1 Hoowenke giddo noo baamba horoonsi'neemmo…2 Hooenke gobbaanni nooha baambu waa ….3 Tuantino balenni ……...…4 Huxxamino burqanno waa ……5 **Fano bale /burqanno waa**……6 Fano buqanno waa …7 **Daadanno waa** Lagga ……..8 xashsho/garba /kofatto…….9 xeenu waa…….10 wole xawisi ……11	

Q117	Mini'ne maate shumate horoonsidhanno mini hiittooho? ***(laoottoha shumate mine borreessi)***		Shumate horoonsi'rate injaanno mine .1 Sammi yine ummoonni shumate bale/bashsho rosamino shumate mnie ..2 Silancho yannicha shumate mine …3 Takkontanni dino/ /citu giddo/mullawa xawo… …….4 Wole xawisi ……..……5 _____		→ **X201 sai**
Q118	Konne shumate mini'ne gutunni horoonsidhinanni?		Ee …….1 Dee'ni ..……..2		
Gafa 2: Shekkeere Gargadhanna Xagisa					
Q201	Mini'ne maate giddo 'agoberre' goxanno wote horoonsi'rannohu no ?		Ee …….1 Dee'ni ..……..→		**X 211 Sai**
	Mini'ne maate giddo me''e agaoberre noo'ne ?		Kiirotenni _____		
Q203	Xa'mamaanc ho mini'ninsa giddo agoberre nooro xa'mi	| #1ki |agobere _____ Laoommo ..... 1 Dilaoommo 2	#2ki agobere _____ Laoommo ..... 1 Dilaoommo 2	#3ki agobere _____ Laoommo ..... 1 Dilaoommo 2	
Q204	Maatekki Konni albaanni agoberre mageeshshi yanna afidhino?	____ ____ agannate albaanni	____ ___ Agannate albaanni	____ ____ Agannate albaanni	
Q205	Agoberre maminni afidhinanni?	Mootimmatewiinni Kilinikete /hospitaalete Fayymmate ekistenshinete loosaasinewiinni …….1 Suuqetenni Xagichu mininni …….2 Loosu darginni ……3	Mootimmatewiinni Kilinikete /hospitaalete Fayymmate ekistenshinete loosaasinewiinni …….1 Suuqetenni Xagichu mininni …….2 Loosu darginni ……3	Mootimmatewiinni Kilinikete /hospitaalete Fayymmate ekistenshinete loosaasinewiinni …….1 Suuqetenni Xagichu mininni …….2 Loosu darginni ……3	

		Wole xawisi.....4 Diafoommo/a yiiro/turo…98 kiiro borreessi	Wole xawisi.....4 Diafoommo/a yiiro/turo…98 kiiro borreessi	Wole xawisi.....4 Diafoommo/a yiiro/turo…98 kiiro borreessi	
Q206	Agobere hidhitine horoonsidhin-anni?	Ee .....1 Dee'ni .....2 Dibuuxoomma/o..... 8	Ee .....1 Dee'ni .....2 Dibuuxoomma/o..... 8	Ee .....1 Dee'ni .....2 Dibuuxoomma/o..... 8	►sai X 208
Q207	Agoberete mageeshshi baatooshshe baatte hidhitta/o?	_____ Birrinni	_____ birrinni	_____ birrinnni	
Q208	Maate'ne giddo , ankarro hashsha agobere horoonsi'rino hu no ?	Ee .....1 Dee'ni .....2 Dibuuxoomma/o..... 8	Ee .....1 Dee'ni .....2 Dibuuxoomma/o..... 8	Ee .....1 Dee'ni .....2 Dibuuxoomma/o..... 8	**Sai X 210**
Q209	Ki'ne giddo agobere ankarro horoonsi'rino hu ayeti?	Ayimmate Kaarde 1. _____ 2. _____ 3. _____ 4. _____	Ayimmate Kaarde 1. _____ 2. _____ 3. _____ 4. _____	Ayimmate Kaarde 1_____ 2_____ 3_____ 4_____	
Q210	Agobere horoonsidhin oonnikkihu mayraati?	Shekkeere nookkihuraati……1 Shekkeere tareessitanno biinnicho nookkihuraati… 2 Agobere wodhineemmo dargi noonkekkihuraati …3 Agoberete fooli biso darshiishannohuraati ……4 Agobere iimaanni wodhummaro/moro hunkiishshaae /foole tayissannohuraati.. 5 Agobere horoonsi'ra mitiinsitannohuraati ….6 Agoberete suudi injaannokkihuraati..7	Shekkeere nookkihuraati……1 Shekkeere tareessitanno biinnicho nookkihuraati---- 2 wodhineemmo dargi noonkekkihuraati …3 Agoberete fooli biso darshiishannohuraati ……4 Agobere iimaanni wodhummaro/moro hunkiishshaae /foole tayissannohuraati.. 5 Agobere	Shekkeere nookkihuraati……1 Shekkeere tareessitanno biinnicho nookkihuraati… 2 wodhineemmo dargi noonkekkihuraati -- …3 Agoberete fooli biso darshiishannohuraati ……4 Agobere iimaanni wodhummaro/moro hunkiishshaae /foole tayissannohuraati.5 Agobere horoonsi'ra mitiinsitannohuraati ….6 Agoberete suudi injaannokkihuraati.7	

		Mine agobere afi'noommokkihuraati …..8 Wole xawisi ……9 Diafoommo/a …….....98	horoonsi'ra mitiinsitannohuraati ….6 Agoberete suudi injaannokkihuraati..7 Mine agobere afi'noommokkihuraati …..8 Wole xawisi ……9 Diafoommo/a …….....98	Mine agobere afi'noommokkihuraati …..8 Wole xawisi ……9 Diafoommo/a …….....98	
Q211	Woradu fayyimmate biro biinne gargartanno xagga mini'ne qarqarira kiiffe egentino'ne?	Ee …….1 Dee'ni ..……...2 Dibuuxoommo/a..……8			**Sai X215**
Q212	Meu again albaanni xagga kiinfoonni'ne? ***(xagga kiinfoonni agana wo'mitinokkiro ''0'' borreessi)***	Agannate albaanni [___/___] Dibuunxoonni …..8			
Q213	Saihu 12 agani giddo galtinanni minira kuula/pilaastere xallinoonni?	Ee ....1 Dee'ni..... 2			
Q214	Meu agani albanni girgiddaho pilaasitere/kuula xallinoonni? ***(agana wo'mitinokkiro ''0'' borreessi)***	Agannate albaanni, _____ _____			
Q215	Saihu mittu diri giddo lubbaminohu no?	Ee…….1 Dee'ni..……...2	→ Mamoote lubbami/ntu? _____agani albaanni	Koo/tee Labbaaha 1 Meyaata 2	Diro _____ **/M.D**

Annex 3 ethical clearance letter

ሀዋሳ ዩኒቨርሲቲ
ህክምናና ጤና ሳይንስ ኮሌጅ
የምርምር ስነ-ምግባር ም/ኮሚ ቦርድ

HAWASSA UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES
Institutional Review Board

Ref. No: IRB/260/15
Date: 16/03/2023

Name of Researcher(s): **Mesele Alaro, Tarekegn Solomon (PhD, asst. prof.), Meskerem Jiso (MPH)**

Topic of Proposal: ***Utilization of insecticide treated nets and associated factors in Boricha and Bilate zuria woreda, Sidama region, Southern Ethiopia: A mixed cross-sectional study***

Dear researcher(s),
The Institutional Review Board (IRB) at the College of Medicine and Health Sciences of Hawassa University has reviewed the aforementioned research protocol with special emphasis on the following points:

1. Are all principles considered?
   - 1.1. Respect for persons: Yes ☑ No ☐
   - 1.2. Beneficence: Yes ☑ No ☐
   - 1.3. Justice: Yes ☑ No ☐
2. Are the objectives of the study ethically achievable? Yes ☑ No ☐
3. Are the proposed research methods ethically sound? Yes ☑ No ☐

Based on the aforementioned ethical assessment, the IRB has:

A. Approved the proposal for implementation ☑ -Approval period from Mar.07/2023 to Mar.16/2024
B. Conditionally Approved ☐ -Element Approved: Protocol Version No. 1
C. Not Approved ☐ -Follow up report expected in 6 months

Obligation of the PI:

1. Should comply with the standard international and national scientific and ethical guidelines
2. All amendment and changes made in protocol and consent form needs IRB approval
3. The PI should report SAE within 3 days of the event
4. End of study, including manuscript should be reported to the IRB

Yours faithfully,

Dr. Enbialo Mengiste (Ph.D. Associate Prof.)
Chairperson, Institutional Review Board

■: + 046 8209290 Website: Fax: + 046 2208755 ☒ 1560 CMHS, Hawassa-Ethiopia