ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

Assessment of ownership and factors affecting utilization of Insecticide Treated bed nets in Dembecha woreda, west gojjam zone, Ethiopia from September 2013 to June 2014.

By

Dawit Siraw (BSc)

A THESIS SUBMITTED TO THE SCHOOL OF GRAGUATE STUDIES OF ADDIS ABABA UNIVERSITY AS PARTIAL FULFILMENT OF THE REQUIRMENTS FOR THE DEGREE OF MASTER OF GENERAL PUBLIC HEALTH.

Advisor

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List of Acronyms and abbreviation

ITNs- Insecticide Treated Bed net

WHO- World Health Organization

LLIN- Long Lasting Insecticide Net

IRS- Indoor Residual Spray

EFY- Ethiopian Fiscal year

SPH- School of Public Health

AAU- Addis Ababa University

FGD-Focus Group Discussion

FDRE- Federal Democratic Republic of Ethiopia

U5- Under five year

MIS-Malaria Indicator Survey

DHS- Demographic and Health Survey

Abstract

Background: Malaria is a preventable and treatable mosquito-borne disease. Approximately 52 million people (68%) live in malaria risk areas in Ethiopia. Dembecha woreda annual report shows that malaria is responsible for 13,852 morbidities (10% of the community) (2012/13 EFY). Observation and rumors of not hanging nets at all, hanging nets in a wrong manner and place and not giving priority to children and pregnant mothers deserve close examination. Thus, this study tries to describe Insecticide Treated Bed Net ownership, utilization and factors affecting in Dembecha woreda, Amhara region, Ethiopia.

Objective: The main objective of this study is to assess the ownership and factors affecting utilization of Insecticide Treated bed nets in Dembecha woreda, west gojjam zone, Ethiopia.

Methodology:A Cross sectional study was used and interview was conducted using structured questionnaire to assess the ownership and factors affecting utilization of Insecticide Treated bed nets in Dembecha woreda, from January 2013 to March 2014. A total of 380 households were systematically selected from the study kebeles by using their respective household head name list which was obtained from kebele administration from four kebeles. A structured questionnaire was used for data collection. ITNs ownership will be assessed by interviewing and observation while net utilization by history of reported use of the net during last night. The data was entered and analyzed using EPI info version 3.5.1 and SPSS version 16.

Result: Malaria was recognized as a major problem. Possession of at least one net was reported by 79.2% of the households is much better than other studies. However use under a net was 40.5%. The main reason showing the discrepancy goes to use of nets for other purposes than primarily intended(eg. used as clothe, used for transporting ‘chid’, used as curtain and the like. and leaving the nets in the package. Factors associated with use were: education, knowledge and getting health information.

Conclusions and recommendations: Reasons for improper use were housing condition, and lack of awareness. Selection of control measures, should take into consideration local situation. Once chosen as methods of prevention, mosquito net distribution should have proper guideline and local capacities for doing so should be strengthened.

1. Introduction

1.1 Background

Malaria is an entirely preventable and treatable mosquito-borne illness. In 2013, 97 countries had ongoing malaria transmission.An estimated 3.4 billion people are at risk of malaria, of whom 1.2 billion are at high risk. There were an estimated 207 million cases of malaria in 2012 and an estimated 627 000 deaths. 90% of all malaria deaths occur in sub-Saharan Africa. (1) In 2012, malaria killed an estimated 482 000 children under five years of age. That is 1300 children every day or one child almost every minute.Between 2000 and 2012, the scale-up of interventions helped to reduce malaria incidence rates by 25 % globally, and by 31 % in the WHO African Region. (1)

In 2013, an estimated 136 million long-lasting insecticidal nets (LLINs) were delivered to endemic countries, a major increase over the 70 million bed nets that were delivered in 2012. About 200 million LLINs have been funded for delivery in 2014, suggesting an even stronger pipeline for 2014.(1) Population access to LLINs remains below the target of universal coverage and has not appreciably improved over the last two years because of the low numbers of LLINs delivered in 2011 and 2012. (1)

The World Health Organization recommends that LLINs be distributed for free to achieve universal coverage (one LLIN for every 1.8 people in the target population) of those at risk for malaria. (1)ITNs intervention involves trying to achieve universal ownership of LLINs within a population, giving free new LLINs to the people who do not already have them. Evidence suggests that when large numbers of people use LLINs to protect themselves while sleeping, the burden of malaria can be reduced, resulting in a reduction in child mortality among other benefits. (1)LLINs cost under $10 each to purchase and distribute (including all costs), and this intervention is generally considered to be among the most cost-effective ways to save lives. Mass distribution of LLINs is in the same range of cost-effectiveness as other priority programs we have considered. (1)

Africa is the most affected continent: where 90% of all malaria deaths occur. In South East Asia, the second most affected region in the world, India has the highest malariaburden (with an estimated 24 million cases per year), followed by Indonesia and Myanmar (1, 2).

About three-quarters of the total area of Ethiopia is malarious with an estimated 48million (68%) of the population being at risk (3).The national prevention and control approach employs early diagnosis and prompt treatment, selective vector control including use of ITNs, early detection and control of epidemics and prevention of malaria during pregnancy(4). Selection of control measures should consider the magnitude of the problem, behavior of vector species involved, vector breeding site, availability of resources, level of transmission, and sustainability of the selected intervention(5). Use of chemical insecticide has been the principal method of vector control since early 1960s. Later, insecticide resistance, high cost and high re-plastering rate of houses necessitated the utilization of all appropriate technologies in an integrated approach(6).Most of the malaria transmission occurs between September and December, after the main rainy season from June to August. Certain areas, largely in the western and eastern parts of the country experience a second "minor" malaria transmission period from April to May, following a short rainy season from February to March (7).

1.2 Statement of the problem

Malaria has been recognized as cause of a lot of human calamities. Dembecha woreda is one of the malaria hot spot districts in the country where most of the district's population is at risk. Malaria undermines the health and welfare of families, endangers the survival and education of children, debilitates the active population and impoverishes individuals and countries (5). Malaria is mainly seasonal with unstable transmission in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys. According to malaria indicator survey of 2007, historically, in Ethiopia there have been an estimated 10 million clinical malaria cases annually. Even though the trend is decreasing, current morbidity and mortality rates are intolerable. The cost intense of lives lost and of those whose lives are affected is staggering. The consequence of these problems of malaria goes far beyond health to affect the economic circumstance of the communities; and intern the deviant prospects of the country in which malaria is rife (8). Over the past years, malaria has been consistently reported as the leading cause of outpatient visits, hospitalization and death in health facilities across the country. The diverse eco-climatic condition in the country makes the malaria transmission

pattern seasonal and unstable usually characterized by frequent focal and cyclic widespread epidemics (9). Indoor residual spray is generally limited to malaria epidemic prone areas, while ITN are more effective in areas with relatively intense malaria transmission (10). The national strategic plan for ITNs aims to scale up use and coverage by target districts. Major constraints mentioned were low awareness, poor institutional capacity and low income of the population to buy nets (10).

The 2007 malaria indicator survey showed that actual LLIN ownership and use fall short of predictions based on administrative‖ coverage rates. Some reports show that it is likely that up to 40% of LLINs are lost‘(e.g. due to wear and tear, or alternative use) by the end of the second year of ownership. This loss is primarily a result of not having a plan for maintaining continuous, high LLIN coverage through replacement of old nets during the scale-up period. To address this, the new strategy outlined below includes (i) mechanisms for ensuring a continuous replacement of lost ‘nets with new ones so that all families at risk of malaria can protect themselves; and (ii) approaches to cover those households in malaria-endemic areas that did not receive LLINs in previous distributions (e.g. due to LLIN shortages or increase in family size) (11).

1.3 Rationale of the study

Despite the activities pertaining to the distribution of ITNs, many questions remain unanswered. The extent to which people are aware and acquire nets is not understood clearly. Observation and rumors of not hanging nets at all, hanging nets in a wrong manner and place and not giving priority to children and pregnant mothers deserve close examination. The perception of the population on the role of ITNs in the prevention of malaria is still another issue (5). In Ethiopia, despite the intense activities pertaining to the distribution of ITNs performing indoor residual spraying and provision of anti-malaria drugs free of charge, many questions about malaria remains unanswered. These includes, the extent to which people are aware of the benefit of ITNs and IRS the value they give them, factors affecting its utilization and the individual and external factors influencing those interventions(10). Dembecha woreda community is in challenge of high morbidity due to malaria. Patient statistics at the health institutions confirmed the high prevalence of malaria in the woreda. The woreda annual report shows that malaria was responsible for 13,852 cases (2013/14 EFY) (12).

Thus, this study tries to describe the utilization and factors affecting Insecticide Treated Bed Net in Dembecha woreda, Amhara region, where ITNs have been distributed. Having these concepts this study would generate vital information that has important contribution in the evidence based redesign of ITNs as the main malaria control program (12).

This community based study will be conducted to investigate some of the factors that affectthe Utilization of Insecticide Treated bed net in Dembecha woreda, west gojjam zone, Ethiopia among peoples living in Dembecha woreda (12).

2. Literature Review

Nets are now made of cotton, nylon, polyester, polyethylene and synthetic with cotton mixtures (11). Nets are preferably treated with insecticides If not possible; they can be used untreated (11). All patients, however, should be notified when they are in a malaria hot zone (i.e. an area of increased risk of malaria), and should be strongly advised to use available LLINs to the maximum extent possible, especially pregnant women and young children. By protecting people from being bitten by infected mosquitoes, LLINs are an effective tool to significantly reduce morbidity and mortality due to malaria (11). Persons living within 1 km of recent malaria cases should be advised to sleep under their long-lasting insecticidal nets (LLINs) (11). The main malaria parasites are P. falciparum and P. vivax, accounting for 60% and 40% of all cases, respectively. Anopheles arabiensis is the main vector; Anopheles pharoensis is also widely distributed in the country and is considered to play a secondary role in malaria transmission (11). Nets have been in use since very early times to protect people against different insects, includingmosquitoes (13). Nets can have rectangular, circular wedge or other shapes and are produced in different colors (13). For individuals personal protection against mosquito bites represents the first line of defense for malaria prevention (14).

2.1 Impact of ITNs on mortality and morbidity

Several studies have shown that using an insecticide treated net (ITN) is effective in reducing the man-vector contact and prevent malaria (15). The use of ITNs on a large scale reduces clinical malaria episodes by 48% and saves 6% of 1,000 children below five years of age (16). Despite the evidence that the use of ITNs decreases malaria-related morbidity and mortality, the use of ITNs in sub-Saharan Africa remains relatively low. Estimates from Africa as a whole indicated

that, in 2005, only 3% of children less of than five years of age sleep under ITNs, while up to ten times as many are thought to sleep under any bed net(16). A study done in Western Kenya shows that improving local understanding of malaria, and persuading people that ITNs could help reduce morbidity and mortality associated with the disease (17).

Nevertheless, it is worth noticing that what nets provide is far from absolute protection for adults who go to sleep late and might leave their bed any time during the night. Some who used the nets did develop malaria as infection might occur before going to bed (18). It was found that 10.5% of bites were not prevented and those were mostly before down. Potential exposure occurring when people leave the bed to check on noise or urinate. People might not tuck in the net properly when returning (19).

2.2 Role of ITNs

By protecting people from being bitten by infected mosquitoes, LLINs are an effective tool to significantly reduce morbidity and mortality due to malaria. Additionally, when coverage rates are high and if a large proportion of human biting by local vectors takes place after people have gone to sleep, LLINs also can have an impact on vector populations. A LLIN has three main functions: i) When mosquitoes are in contact with the net, it has a knock-down effect, temporarily incapacitating or even killing mosquitoes; ii) It has a repellent effect; and, iii) It reduces contact between the person sleeping under the net and mosquitoes by acting as a physical barrier. LLINs also have an effect on other insects, such as head lice, sand flies, ticks and other household pests (e.g. bedbugs and cockroaches) (11).

In a Kenyan coast with a similar objective, nets were labeled as intact when having no visible holes, satisfactory when having less or equal to five small hole and worn out if otherwise (20).The proportion of children who were *P.falciparum* positive was similar among those that did not sleep under a net and those that slept under an untreated net that was worn. Yet it was lower for those that slept under an untreated net that was in good condition when compared with those that did not sleep under a net (20).

2.3 ITNs Ownership and Utilization

The number of long-lasting insecticidal nets delivered to malaria-endemic countries in sub-Saharan Africa increased from 88.5 million in 2009 to 145 million in 2010. An estimated 50% of households in sub-Saharan Africa now have at least one bed net, and 96% of persons with access

use it(2).To achieve universal access to long-lasting insecticidal nets (LLINs), 780 million people at risk would need to have access to LLINs in sub-Saharan Africa, and approximately 150 million bed nets would need to be delivered each year(2).The number of LLINs delivered to endemic countries in sub-Saharan Africa dropped from a peak of 145 million in 2010 to an estimated 66 million in 2012. This will not be enough to fully replace the LLINs delivered 3 years earlier; indicating that total bed net coverage will decrease unless there is a massive scale-up in 2013. A decrease in LLIN coverage is likely to lead to major resurgences in the disease (2). Ethiopia has distributed 42 million insecticide-treated bed nets (ITNs) long-lasting insecticidal nets (LLINs) (21).National malaria indicator survey shows that net ownership with at least one mosquito net in malaria-endemic areas in MIS 2011 is (55.2%) (21). Nationally progress has been observed in terms of net use among children U 5 in households that owned nets. The percentage of children under the age of 5 who had slept under a mosquito net the night preceding the survey was 64.5% in2011(21).According to national malaria guideline 2012 states that100% of households in malaria-endemic areas own one LLIN per sleeping space.Nationally, the results show that the percentage of households with at least one mosquito net in malaria-endemic areas is lower in MIS 2011 (55.2%) than in MIS 2007(68.9%) (21).Nationally, progress has been observed in terms of net use among children U5 in households that owned nets. The percentage of childrenU5 who had slept under a mosquito net the night preceding the survey was 60.2% in 2007, increasing to 64.5% in 2011(21).

According to a study conducted in western Kenya, Despite ITN ownership reaching more than 71%, compliance was low at 56.3%. The compliance rate was significantly higher during the rainy season compared with the dry season (62% vs. 49.6%). Both malaria parasite prevalence (11.8% vs. 5.1%) and vector densities (1.0 vs.0.4 female/house/night) were significantly higher during the rainy season than during the dry season. Other important factors affecting the use of ITNs include: a household education level of at least primary school level, significantly high numbers of nuisance mosquitoes, and low indoor temperatures. Malaria prevalence in the rainy season was about 30% lower in ITN users than in non-ITN users, but this percentage was not significantly different during the dry season (22). A study conducted in Cameroon shows that, Net possession and use were respectively, 59.7 and 42.6%; thus, 2 out of 5 people who spent the previous night in households, slept under a net (23). ITNs programmes, more than other vector control methods, depend to a large extent on the acceptance and active involvement of

individuals and communities. Communities should certainly be involved as much as possible in re-treatment issues, but there must be a lead organization to ensure that re-treatment is accessible to the communities and families most at risk, is done at the right time and achieves high coverage correct dosage (24). According to a study done in Burkina Faso, The motivation for the use of bed nets decreased after less than a year. Inhabitants' conception of malaria and the inconvenience of using bed nets in small houses were the major reasons. Acceptance that ITNs were useful in reducing malaria was moderated by the fact that mosquitoes were considered to be only one of several factors which caused malaria. The appropriate and routine use of ITNs was adversely affected by the functional organization of the houses, which changed as between day and night. Bed nets were not used when the perceived benefits of reduction in mosquito nuisance and of malaria were considered not to be worth the inconvenience of daily use (25).

A study done in malarious areas of Eritrea shows determinants of insecticide treated net (ITN) ownership and use are: environmental heterogeneity, perception of risk, and proximity to a clinic are important predictors of ITN possession and use. Among households with at least one ITN, 17.0% reported that children under five were not under an ITN the night before the survey, while half of all such households did not have all occupants using them the night before the survey. The number of ITNs was also significant determinants of use in those households with at least one ITN (27).

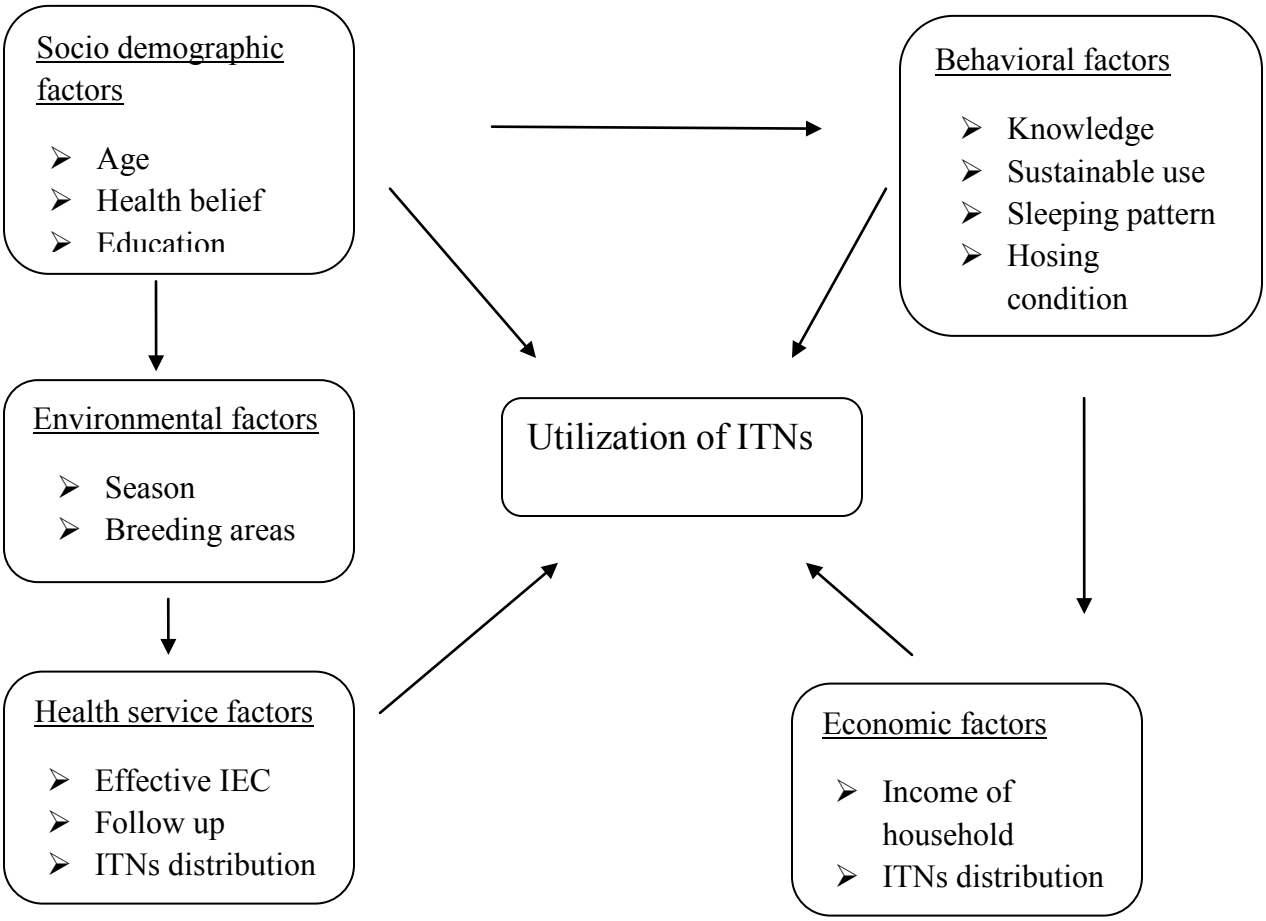
2.4 Health beliefs and mosquito net use

Nets are perceived by many as means of protection to mosquito bite rather than malaria prevention. In a study to monitor community responses to malaria control measures in Nigeria, the proportion of people who perceived that mosquito net prevent malaria (22%) was less than those who believe in its prevention against mosquito bite (96%) (19).Health belief pertaining to causation of malaria and role of nets is an important factor. A study conducted in Uganda showed that despite most households owning mosquito nets, participants of focus group discussions confirmed that some people do not use the nets because they associate them with breathing difficulties (26). In a study conducted in Rural Burkina Faso although most people mentioned mosquito as transmitter of malaria, humidity exposure to rain and cold were also mentioned as causative factors (28).

2.5 Housing condition and mosquito net use

According to a study done in Cameroon on Factors associated to bednet use shows an association between increasing net use and poor house's construction allowing easy access of mosquitoes, as well as the environment favorable to mosquito proliferation (23).Moreover, most houses in the rural area are made up of mud and wood material, which sometimes have holes of walls. These houses often do not have a ceiling, or doors on bedrooms or windows. The abundance of mosquitoes creates a high nuisance, making populations to use mosquito nets. In line with these observations, previous studies have shown housing characteristics to be associated with increased mosquito numbers in homes (23).Few studies mentioned logistical problems of households to use nets. In Kenya sleepingarrangements were generally perceived as posing challenges, as sleeping areas for children inliving rooms and kitchens require daily commitment to mount and dismount nets (30). In a study in Afghan refugees, 11% of the study population slept on floor. For such people nets were suspended from ceilings or between four upright poles held in mud filled *ghee* cans (18).

Conceptual frame work



3. Objectives

3.1 General Objective

The ma in objective of thi s s tudy is to assess ownership and factors a ffecting utilization of Insecticide Treated bed nets in Dembecha woreda, west gojjam zone, Ethiopia.

3.2 Specific objectives

1. To determine ITNs coverage of the woreda
2. To identify factors affecting ITNs Utilization

4. Methodology

4.1 Study area

Dembecha woreda is located 220 km from Bahir Dar (capitalof Amhara region) and 349 km North West of Addis Ababa.Its altitude is 1885 meters above sea level, with woina dega climatic condition which is among the known malaria risk areas in the country. Average annual temperature is 25.1 degree Celsius and the annual rainfall is 1006 mm.Dembecha woreda has a total population of 147,448 (projected population from 2007 national population census). The woreda has 29 kebeles in which all kebeles are hot spot to malaria.

4.2 Study design

Cross sectional study was conducted using interviewer administered questionnaire which was adopted and modified from " Assessment of Use of Insecticide Treated Mosquito Nets and Factors Affecting it in Serbo Town by Sofonias Getachew ''to assess ownership and factors affecting utilization of Insecticide Treated bed net.

4.3 Study population

Sampled households in the woreda were used as a study population for the survey.

4.4Sample size

To determine the required data, representative sample size was determined using formula for a single population proportion based on the following assumptions.

Percentage of net use among children U5 in households in Amhara region was 65.7% in 2011 malaria indicator survey. We will take 0.66 , Margin of error of 5%, 95%, Confidence level, contingency for non-response rate 10%.

$$n = \frac{Za/2^2 \times p(1-p)}{d^2}$$

$$= \frac{(1.96 \times 1.96) \times .66(1-.66)}{(0.05 \times 0.05)} = \mathbf{345}$$

Considering 10% contingency, the sample size was;

n= 345+ (345x 10%) = **380**

With 10% contingency the total sample size was be 380. No population correction was used. Since the total number of households with the required character was 380, all were included in the study.

4.5Sampling Technique

First, the 18highly malarious and 11 medium malarious kebeleswasidentified and stratified into two strata based on burden of the disease and there is no kebele which has low burden of disease. Then, two kebeles from highly malarious stratum and twokebelesfrom medium malarious stratum were randomly selected for the study and totally 4 kebeles were used. Second, a total of 380 households were distributed bysystematic random sampling and used to select from the study kebeles by using their respective household head name list which was obtained from kebele administration.

4.6Data collection technique

Data collectors who were residents of the woreda and professionally health extension workers who worked there in study area were recruited to serve in this study. Recruitment was by considering their familiarity with that specific kebele (study area), but in order to avoid bias health extension workers werematched each other. They were given training by the principal investigator. Training included briefing about the objectives, relevance of the study and administration of the questionnaires. They were also trained how to spell out the questions. The questionnaire was pre tested in a town named Amanuel, located 20 kms from the study site.

Then data collectors were interviewed heads of households (spouses of heads of households if the head is absent) where there is a marital relationship. If not, the person registered as the head of the household by legal authorities was taken. Such people can be grandparents or single parents. If the respondentswere not found, two repeat visits were done.

The questionnaire was prepared in English and translated in Amharic. Main points included were socio-demographic characteristics, knowledge on malaria and the major household, organizational factors influencing ITNs for malaria prevention strategy. Field supervision was conducted which included rechecking of some of the questionnaires on house to house basis.

4.7 Operational definitions

Malaria= a short duration of febrile illness usually accompanied by headache, shivering, joint and muscle pain

Insecticide treated bed net/LLINs=a cloth/nylon used by individuals to sleep under it by hanging on a roof to avoid mosquito bite which transmits malaria.

Tear – Loss of integrity of a net that communicates with the edge and greater than 2 centimeters

Hole - Loss of integrity or opening of a net that does not communicate with the edge and is greater than 1centimeter.

Knowledgeable-A respondent who answered at least three of the seven knowledge related questions

Exposed to health education-Claimed to get health education on malaria in general and mosquito net in particular

Village = a small governmental /administrative unit which is a sub-component of woreda

Household= all persons (families) living together in a house

Household head = a leader of a family (household) who is designated by the other members

4.8Data analysis

Data was entered after being encoded and analyzed using EPI info version 3.5.1 and SPSS version 16 statistical packages .The result was presented in the form of table. Percentage and odds ratio to measure associations was used for analysis. For this study statistical significance was defined at probability level of 0.05. Logistic regression was done to identify factors related to ITNs for malaria prevention strategy. Resultswere written, reorganized, summarized and quoted.

4.9 Data Quality Control Methods

To maintain the quality of the data structured and pre-tested questionnaires and standardized questionnaire and checklist adopted from other study mentioned above was used to collect information. One day training was given to all data collectors on the data collection procedure, the content of the questionnaire and checklist and objective of the study. The collected

information was frequently checked at the field by the supervisor. The overall coordination was made by the principal investigator. The questionnaire and checklist was checked for completeness every night at the time of data collection. Feedbacks on previous day activities were given for data collectors before the next day data collection.

4.10 Ethical consideration

The research proposal was presented to the SPH/AAU for approvaland approval was obtained and also the woreda health office consent also obtained. Verbal consent from respondents wasobtained to conduct the interview. The data collectors were oriented during the training so that they wereprovided proper advice for the respondents regarding any malpractice they will come across.

4.11 Dissemination of the study findings

Final reportwill be submitted to the School of Public Health and presented orally. To help in future interventions the result will be communicatedprimarily to the study woreda health office and governmental and non-governmental bodies. These include the Zonal Health Department, and Federal Ministry of Health Malaria Prevention and Control Department. In addition effort will be exerted to publish the paper and critiques that will be written based on the practical exposure.Findings of this study will be disseminated to woreda health office so that the woreda will work depending on the gap identified, ministry of health so that policy makers will use this information to modify malaria prevention and control methods.

4.12Inclusion and Exclusion Criteria

- The respondents for the interview must be individuals aged above 18 years living in the household will be included in the study.
- Relatives coming during the study period and household heads with hearing impairment will be excluded.

4.13Variables of the study and M

easurement

Dependent Variables

The s tudy has one de pendent va riable: The us e of bednets. In t his s tudy, t he de finition of ITNsincludes long lasting insecticide treated nets and all other insecticide treated nets. Therefore, all i nsecticide t reated nets, whether l ong l asting i nsecticide t reated nets or r etreated nets ar e referred to in this paper as ITNs. Non treated nets were not included in the definition of use.

Independent variables

The i ndependent va riables i n t his study are: age , sex, oc cupation, income, hous ing condition, education, knowledge about cause of malaria (i.e. knowingthat it is transmitted by mosquitoes). Compositemeasure f ormisconceptions a bout c auses of m alaria',and 'misconceptions a bout prevention of malaria' werebased on variables identified from previous studies.

5. Result

5.1) Socio demographic characteristics

A total of 380 households were included in the study, the respondents being either the head of the household or the spouse. As shown in Table one, 175(46.1%) were husbands and 138(36.3%) were wives in households where there was a marital relationship. The rest were single heads of households or grandparents. Mean age of the head was 34.59years (SD=11.9). On average there were 4.65 persons per household. 202(50.4 %) of the households had four or less than four members. The rest had more than four members. One hundred thirteen (29.7%) of the heads could not read and write while 62(16.4%) had education above grade 8. Two hundred seventy eight (73.2 %) were farmers, 31(8.2%) were merchants and 11(2.9%) were government employees. The rest were house wives and students.

5.2) Sleeping conditions

Not everyone in the woreda slept on bed. Sixty (15.8%) of the households had no bed. As in Table 2, 99(26.1) had one sleeping floor or medeb while 240(63.2%) had more than one. In 242(63.7%) households one up to three people slept on bed while in 208(54.7%) of households a similar number of people slept on floor or medeb.

5.3) Access to information, knowledge and perception.

As depicted in Table 3, Three hundred sixty four (95.8%) got health information pertaining to malaria. Three hundred twenty six (85.8%) heard about bed net. One hundred twenty four (32.6%) were labeled as knowledgeable as they correctly answered at least three of the seven knowledge questions (Table1). Common sources of information were health workers and school.

Table 1, Distribution of the respondents by factors predisposing to net use Dembecha Woreda, West Gojjam, North West Ethiopia, and June 2014.

Factor	Category	No (%)
Heard about malaria	Yes	364(95.8)
	No	16(4.2)
Heard about bed net	Yes	326(85.8)
	No	54(14.2)
Knowledgeable	Yes	124(32.6)
	No	256(67.4)

*Mentioned at least three of the seven knowledge related questions

At least three symptoms of malaria were mentioned by 124(32.6%) of respondents. Children and/or pregnant women were labeled as more affected group by 172(45.3%). One hundred forty eight (38.9%) Know the cause of malaria. Two hundred eighteen (57.4%) knew the reason for treatment.

Table 2, Distribution of the respondents by their knowledge pertaining to malaria and its prevention, Dembecha Woreda, West Gojjam, North West Ethiopia, and June 2014.

Character		**No (%)**
Know at least three symptoms	Yes	124(32.6)
of malaria	No	256(67.4)
Know children and/ or	Yes	172(45.3)
pregnant women more affected	No	208(54.7)
Know the cause of malaria *	Yes	148(38.9)
	No	232(61.1)
know reason for treatment **	Yes	218(57.4)
	No	162(42.6)
know the place where mosquito	Yes	254(66.8)
Bread	No	126(33.2)
Source of information	Health workers	303(79.7)
for ITNS	Schools	83(21.8)
	Radio	62(16.3)
	Others	57(15)

*Mentioned mosquito bite.

**mentioned either repelling and/or killing of mosquitoes

5.4) Malaria and its prevention

Different methods were reported as a main method for prevention of malaria by the households. As described in Table 5, Out of the total households 324(85.3%) mentioned taking tablets, 220(57.9%) mentioned cleaning home and the surrounding environment as the second main prevention methods, followed by mosquito net use by 154 (40.5%) and DDT spray by 106(27.9%).

Table 3, Distribution of the respondents by methods of prevention of malaria, Dembecha Woreda, West Gojjam, North West Ethiopia, and June 2014.

Main methods of prevention		No (%)
Cleaning home and environment	Yes	220(57.9)
	No	160(42.1)
Mosquito net use	Yes	154(40.5)
	No	226(59.5)
Fumigation	Yes	70(18.4)
	No	310(81.6)
Closing doors and windows	Yes	9(2.4)
	No	371(97.6)
Taking tablets	Yes	324(85.3)
	No	56(14.7)
DDT spray	Yes	106(27.9)
	No	274(72.1)
Other methods	Yes	11(2.9)
	No	369(97.1)

As shown in Table 4, a total of 79(20.8%) households had no mosquito net, 173(45.5%) had one net, 101(26.6%) had 2 nets while 27(7.1%) had three. Not all mosquito nets were used over the sleeping areas. One hundred fourty one (46.8) were hanged, 93(30.9) were stored after use, 53(17.6%) were used for other purposes and 14(4.5%) were in package. Yet the figure for ever sleeping under a net was 154 (40.5%). Among the households who hanged it over their sleeping place at the time of data collection, 123(87.2) had it over a bed and the rest 18(12.8) over a sleeping floor/medeb.

Mean number of nets was 1.37 per household. Almost all the households were given for free. Mean interval between successive washings for those who have net was 18 weeks. The average time since acquiring net was 2.25 years (SD=0.7).

Table 4, Distribution of households by use of mosquito nets, in Dembecha Woreda, West Gojjam, North West Ethiopia, and June 2014.

Characters tics		No (%)
Possession of bed net	Yes	301(79.2)
	No	79(20.8)
Number of nets	0	79(20.8)
	1	173(45.5)
	2	101(26.6)
	3	27(7.1)
Status of bed net	In package	14(4.7)
	Hanged	141(46.8)
	Stored after use	93(30.9)
	Other purpose	53(17.6)
Slept under a net the previous Night	No one	140(36.8)
	< 5 years children	61(16.1)
	5-10 years children	18(4.7)
	Parents	150(39.5)
	Others	11(2.9)
Utilization of bed net	Used	233(61.3)
	Not used	147(38.7)
Where bednet hang (N=141)	On bed	123(87.2)
	On floor/medeb	18(12.8)

5.5 Multivariate analysis

As the time of the conduct of the study was not of the main transmission season for malaria and only 61 (16.1%) of the households especially under five years children sleeping under a net the previous night.Univariate analysis of different variables as related to letting the family members sleep under a net at least once was done. As seen on Table 7 educational status of head, sex of the household head, number of beds, being knowledgeable, monthly income, know where mosquito breed, heard about bednet, heard about malaria, and residence(kebele) were all associated with letting family members to sleep under a net at least once. When controlling for confounders education, knowledge, heard about malaria, heard about bednet and income remainssignificant.

Table 5: Logistic r egression of pr edictors of bed n et utilization a ho usehold i n Dembecha Woreda, West Gojjam, North West Ethiopia, and June 2014.

		Bed net Utilization		OR	Adjusted OR
		Yes	No	(95% CI)	
Sex	Male	98(53.6)	85(46.4)	0.529(0.349-0.804)	1.53(0.859-2.628)
	Female	137(69.5)	60(30.5)	1.00	1.00
Education status of the head	Cannot read and write	50(44.2)	63(55.8)	1.00	1.00
	Grade 1 up to grade 4	93(68.4)	43(31.6)	2.725(1.623-4.575)	2.82(1.459-5.452)
	Grade 5 up to grade 8	47(68.1)	22(31.6)	2.692(1.437-5.043)	3.334(1.524-7.295)
	Above grade 8	45(72.6)	17(27.4)	3.335(1.706-6.519)	7.932(3.063-20.54)
Monthly income (birr)	<500	70(70)	30(30)	1.00	1.00
	500-1000	143(64.7)	78(35.3)	2.961(1.521-5.763)	0.76(0.412-1.389)
	>1000	22(37.3)	37(62.7)	2.621(1.456-4.718)	0.18(0.078-1.479)
Residence	Yesheboch	78(74.3)	27(25.7)	2.728(1.233-6.0380	2.018(0.736-5.53)
	Godber	58(58.6)	41(41.4)	1.336(0.616-2.898)	1.435(0.53-3.884)
	Lejet	81(57.4)	60(42.6)	1.275(0.607-2.678)	1.24(0.491-3.131)
	Yechereqa	18(54.1)	17(48.6)	1.00	1.00
Knowledge	More Knowledgeable	86(69.4)	38(30.6)	1.625(1.031-2.563)	3.037(1.699-5.428)
	Less Knowledgeable	149(58.2)	107(41.8)	1	
Heard about Malaria	Heard	229(62.9)	135(37.1)	2.827(1.005-7.953)	3.333(1.048-10.597)
	Don't heard	6(37.5)	10(62.5)	1.00	1.00
Heared about Bednet	Heard	222(68.1)	104(31.9)	6.732(3.450-13.103)	11.242(5.107-24.75)
	Don't heard	13(24.1)	41(75.9)	1.00	1.00
know where mosquto breed	Know	120(65.6)	63(34.4)	2.205(1.423-3.416)	0.97(0.53-1.83)
	Don't know	53(74.6)	18(25.4)	1.00	1.00
Number of beds	2 or more	76(64.4)	42(35.6)	1.93(1.078-3.456)	1.591(0.789-3.206)
	1	130(64.4)	72(35.6)	1.934(1.029-3.636)	1.263(0.567-2.81)
	0	29(48.3)	31(51.7)	0.935	1.00

6. Discussion

In this study methods of prevention mentioned were: taking tablets, cleaning of the environment, use of mosquito nets and fumigation of different plants in that order. This differs from the prevailing practice in some other countries. In a study in Burkina Faso, mosquito coils were the most commonly used methods (28).In one study in Kenya, mosquito coils were used by 43% of the households (29).

An average of 4.65 persons per household is similar to the national figure (32). For such size, two mosquito nets per household are required. Therefore, the 1.37 nets per household can be said a good figure. This figure was much better than the finding in other African countries, where the figure for ITNs was 0.25 nets per household (33).

Possession of at least one net was reported by 79.2% of the households. However use under a net was 40.5%. The main reason showing the discrepancy goes to use of nets for other purposes than primarily intended. The lower than expected number of nets speaks in favor of unfair distribution and/or selling of nets.

In a study in one municipality in Uganda, 55 % of the households studied had at least one mosquito net (34). The 2000-2001 Demographic and Health Survey of Uganda showed that thirteen percent of households in the country possessed at least one net (35). Yet, in the same study only eight percent of children living with their mothers usually sleep under a mosquito net. The explanations given were that children were less likely to use mosquito nets even if available and those who do not share bed with their parents were less likely to do so (35).The latter appears to work for the current study as some of the young children who have younger brothers or sisters did not have the chance to sleep under the net. But another reason had been not using the net for its actual purpose. In sixty nine surveyed regions in twelve countries in Africa, ITNs possession varied between 0.1-25.5percent.The corresponding use during the preceding night by children under age of five was 0-16%. Explanation given was that the nets were not enough for the family members (37).

Regarding the condition of nets, 14(4.7) % of the nets were in package, 93(30.9) stored after use and 53(17.6) were used for other purpose.

Higher ever use by under five children years, compared to those aged 5-10 years children (16.1 Vs 4.7) was in contrast to many experiences in Africa. In Kenya, a 14.5% reduction in probability of adherence was observed in children under the age of five (29). Children were however said to have this higher coverage by virtue of their sleeping with their mothers. This is in congruity with a finding in Uganda where young children sleeping with their mothers had higher chance of net use (34).

Unlike the result of the current study, presence of a bed has not been found in other literatures as a determinant factor. Possible explanation being most of the houses, even rural, where the cited studies were conducted had beds.

An exception is a study in Kenya where sleeping arrangement for children in living rooms and kitchens required daily commitment to mount and dismount nets, which was tedious (30).

The reality of parents getting priority over the use of a bed (if present) is similar to a prior observation in Kenya(30). This has implication in mosquito net use as a young child would be displaced from a bed, where there is better chance of net use, in favor of a younger child. Such practice was also witnessed in the above mentioned Kenyan experience(30).

Health beliefs pertaining to transmission of malaria are important for prevention of malaria. Favorable beliefs were important in predicting use of mosquito nets. People who used nets were more likely to believe that malaria is transmitted by mosquitoes and could be cured by modern medicine (34). The fact that explanation given to malaria causation are naturalistic is in contrary to some findings elsewhere in Africa where supernatural causes are implicated. This is a favorable point for better practice(28). In a study in Southern Ghana, mosquitoes were incriminated by most respondents as cause of malaria. But heat from scorching sun and any other heat related work, poor eating habit, constipation and others were mentioned by a relative minority(38). In Burkina Faso, although most people mentioned mosquito as transmitter of the malaria, humidity exposure to rain and cold were also mentioned as causative factors(28).

When the male heads among Afghan refugees who participated in one study were asked about causes of malaria, 86% stated mosquito bites (18).

Before a trial in western Kenya 47% of mothers stated that getting cold was the sole cause of malaria(39). While participants in all ten FGDs in a study in Kenya cited mosquito as a cause of malaria, this coexisted with traditional beliefs that cold weather and dirty water cause malaria. This may suggest that mosquito nets alone are not enough protection against malaria, and has implications on adherence(30). When coming to this study, similar perception like the above and some additional, like hunger were mentioned. According to the majority of our respondents, more affected groups were young children and pregnant mothers. This is in contrast to some studies in other African countries(39). Use, however, did not match the belief as some young children did not sleep under the nets.

Child protection was simply a co-incidence when the child happens to share a bed with parents (35). Households with under five children or with pregnant women did not have a higher use of mosquito net use(34). Presence of mosquito net use by male adults has also been observed in other sub Saharan African countries(28). Traditionally, adults, by virtue of their age and position as family income earners get priority coverage. The explanation is likely to be economical as well as cultural, as heads are valued and are income generators of the house.

Living condition was observed as an important point in using the net. In households where there are many people sleeping in the same room, there is smoke for preventive activity or domestic use, floor which is earth and no bed, use of mosquito nets as a preferable means of malaria prevention is questionable. Health Education which linked nets with bed and physical character of the net (green color, easily attaching dust) in the study area added to this difficulty. Taking into consideration the above points more difficulty is expected in rural areas regarding using nets.

Problems as a result of sleeping under a net, like perceived heat or others were rare. This is in contrast to other findings. In the study conducted in western Kenya main problems while using are related to sleeping arrangement and perceived heat under nets (30). Other problems infrequently mentioned by studies were chemical smell and daily mounting of nets(39).

7. Strengths and Limitations of the study

Strengths

- Inspection of nets, rather than rely on verbal response helped to refine the information
- The study addressed an area worth being elaborated till these days. This is because the different stakeholders in the prevention of malaria aim to markedly increase distribution of nets.

Limitations

- It was better if qualitative method like FGD and in-depth interview was added in addition to quantitative method so that quality of the research will also increase.
- The use of nets during the high transmission season could not be assessed because it was not malaria transmission season at the time of data collection, thus we use approximation.

8. Conclusions and recommendations

Conclusions

- Not all nets distributed to households are used for malaria or insect nuisance prevention.
- Reasons for such behavior were diverse, i.e. housing condition, health belief and knowledge.
- Young children had better protection compared to other age groups. Yet this is a result of sleeping arrangement
- The practical life span of nets might be shorter than desired.

Recommendations

- Selection of malaria control measures including that of nets should take into consideration local situation like number of people living in the house, sleeping areas and others.
- Once chosen as methods of prevention mosquito net distribution should have proper follow up whether there are mal practices in using the bed nets by the woreda health office.
- Health information dissemination should be provided on continuous and when possible on house to house basis rather than as a onetime activity including demonstration of how to hang nets.
- Education messages should focus on need for prioritizing young children and pregnant mothers other than other family members.
- The trend of using nets for other purposes should be strictly forbidden.

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Participant's Information Sheet

Title of the Research Project

To assess ownership and factors affecting Insecticide Treated bed net utilization in Dembecha woreda, west gojjam zone, Ethiopia.in Dembecha woreda, west gojjam zone, Ethiopia.

Name of Principal Investigator: Dawit Siraw

Name of the Organization: Addis Ababa University, College of Health Sciences, School of Public Health.

Name of the Sponsor: Addis Ababa University

Information sheet and Consent form prepared for individuals in the study area who are going to participate in this Research.

Introduction

This information sheet and consent form is prepared with the aim of explaining the research project that you are asked to join by the group of research investigators. The main aim of the research project is to assess ownership and factors affecting Insecticide Treated bed net utilization in Dembecha woreda, west gojjam zone, Ethiopia

Risk and /or Discomfort

By participating in this research project you may feel that it has some discomfort especially on wasting your time (a minimum of 40 minutes) but this may not be too much as you are one of the member of the community, so your response will help as an important input to show the gap and means to improve malaria prevention methods appropriate to the entire community. There is no risk in participating in this research project.

Incentives/Payments for Participating

You will not be provided any incentives or payment to take part in this project.

Confidentiality

The information collected for this research project will kept confidential and information about you that will be collected by this study will be stored in a file, without your name, but a code number assigned to you. And it will not be revealed to anyone except the principal investigator and assistants will be kept locked with key.

Right to Refusal or Withdraw

You have the full right to refuse from participating in this research. (You can choose not to response some or all the questions) and this will not affect you from getting any service. You have also the full right to withdraw from this study at any time you wish, without losing any of your right.

Person to contact

This research project will be reviewed and approved by the ethical committee of the Addis Ababa University. If you want to know more information you can contact the committee through the address below. If you have any question you can contact any of the following individuals and you may ask at any time you want.

1. Dawit Siraw

   Mobile: 0913331925/0924662066

E-mail: dawitsiraw33@yahoo.com.com

2. Dr. Desalegn Dalecha (MD,MPH): Addis Ababa University

   E-mail; desalegnju@yahoo.com

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Annex - 2: Questionnaire (English version)

Questionnaire no.....

House number.....

AAU Department of Community Health

Ownership and factors affecting Insecticide Treated bed net utilization in Dembecha woreda

Hello, my name is..... . I am one of the data collectors on the study with the a bove t opic. I w ould l ike you t o c ooperate i n a nswering t he que stions t hat f ollow. T he information you w ill pr ovide c ontributes t o m easures t hat a re t aken t o c ontrol m alaria. A ny information you provide will be confidential. You have the right to not to participate in the study.

Name of Interviewer: _____ Date: _ _/_ _/_ _

Start time: _ _/_ _ End time: _ _/_ _

Interviewer agreement

'I certify that I have filled this questionnaire in accordance with the training I was given and instructions stated in it. I have confirmed that the information in it is correct.'

Signed_____ Date_____

1. Socio-demographic Characteristics

S. No	Questions	Response categories	Skip to
101	Age	_____ years	
102	Sex	• Female ---------- 1 • Male ----------2	
103	Educational status	• Unable to read or write ---------- 1 • Elementary(1-4)---------- 2 • Junior(5-8) ---------- 3 • Secondary(9-12)---------- 4 • 12 and above ---------- 5	
104	Marital Status	• Married ---------- 1 • Single ---------- 2 • Widowed ---------- 3 • Divorced ---------- 4 • Separated ---------- 5	
105	Occupation	• Farmer ---------- 1 • Merchants ---------- 2 • Government employ ---------- 3 • House wife ---------- 4 • Student ---------- 5 • Daily laborer ---------- 6 • Jobless ---------- 7	
106	Status r esponsibility of t he respondent	• Husband ---------- 1 • Wife ---------- 2 • Son daughter ---------- 3 • Other(specify) ----------99	
107	Religion	• Orthodox ---------- 1 • Muslim ---------- 2 • Other(specify) ----------99	
108	Estimated monthly income	• ---------- 1 • I can't estimate ----------88	

2. Perception towards malaria

S. No	Questions	Response categories	Skip to
201	Have you ever heard of malaria?	• Yes ---------- 1 • No ----------2	
202	Is malaria a health problem in your area?	• Yes ---------- 1 • No ----------2	
203	What main symptom of malaria are you aware of? (possible to give more than one response)	• Fever ---------- 1 • Chills & shivering---------- 2 • Headache ---------- 3 • Backache ---------- 4 • Joint pain ----------5 • Vomiting ----------6 • Thirsty ----------7 • Loss of appetite ----------8 • Other (specify) ----------9	
204	What do you do when you or your family member are getting sick from malaria?	• Health center /---------- 1 • Health post/ ---------- 2 • Private clinics ---------- 3 • Purchase drugs from shops ---------- 4 • Traditional healer ---------- 5 • Use the left over drugs ---------- 6 • Use traditional remedies at home ---------- 7 • Others ----------8	
205	Which c ategories/groups of pe ople a re most affected by malaria?	• Adults ---------- 1 • Children under ----------2 • Elderly people---------- 3 • Pregnant women ---------- 4 • all are equally affected ---------- 5 • Other (please specify) ----------6	
206	Is malaria transmissible disease (If No skip to Q 208)?	• Yes ---------- 1 ⇨ 207 • No ---------- 2 ⇨ 208 • I don't know ---------- 3	
207	If Yes to Q 206, how is malaria transmitted from person to person?	• Through mosquito bite ---------- 1 • Through bodily contact with patients ---------- 2 • Breathing ---------- 3 • By flies ---------- 4 • Blood transfusion (contaminated with malaria parasite) ---------- 5	

		• Others ----------6	
208	Where do mosquitoes mostly breed?	• Stagnant water ---------- 1 • swampy areas ---------- 2 • Running water ---------- 3 • Waste material ---------- 4 • Others ----------5	
209	When do mosquitoes mostly bite?	• Day ---------- 1 • Night ---------- 2 • I don't know ----------3	
210	Do you think that malaria can be prevented?	• Yes ---------- 1 ⇨ • No ----------2	211
211	If yes to Q above, What is the most important thing you do in your household to prevent getting malaria (if any)	• Use a bed net ---------- 1 • Take tablets ---------- 2 • Use insecticide sprays ---------- 3 • Drain stagnant water ---------- 4 • Clear the vegetation ---------- 5 • Fumigation ---------- 6 • Close the doors and windows at night ---------- 7 • Other (please specify) ----------8	
212	What is the main cause for malaria you know of.....?	• Working in the sun ---------- 1 • From being in the rain ---------- 2 • From getting cold ---------- 3 • From drinking dirty water ---------- 4 • From another person with malaria ---------- 5 • From being bitten by mosquitoes ---------- 6 • Don t know ----------7 • Other (please specify) ----------8	
213	Have you seen or heard any malaria education messages from any source?	• Yes ---------- 1 ⇨ • No ----------2	214
214	If yes, where did you see or hear these education messages from?	• Radio ---------- 1 • TV ---------- 2 • Friends ---------- 3 • Parents ---------- 4 • Health workers ---------- 5 • Church/mosque ---------- 6 • School ---------- 7	

3. ITNs (insecticide treated bed nets) Related

S. No	Questions	Response categories	Skip to
301	How many rooms do you have in your house (not including the toilet/bathroom and kitchen?	• ----------	
302	How many beds do you have in your home?	• ----------	
303	How many sleeping mats do you have in your home?	• ----------	
304	How many people in your home usually sleep on beds (if any)?	• ----------	
305	How many people in your home usually sleep on mat (if any)?	• ----------	
306	Have you ever seen or heard any messages about bed net from any source	• Yes ---------- 1⇨ • No ----------2	307
307	If yes where did you see or hear these education messages from? (Multiple responses possible)	• Radio ---------- 1 • TV ---------- 2 • Friends ---------- 3 • Parents ---------- 4 • Health workers ---------- 5 • Church/mosque ---------- 6 • School ---------- 7 • Other (please specify) ----------8	
308	Do you have a bed net in the household currently?	• Yes ---------- 1⇨ • No ----------2	309
309	If yes, what is the purpose of it?	• Protect from mosquito bite ---------- 1 • Protect from other insects ----------2 • Sleep better ---------- 3 • Warmer ---------- 4 • Others ----------5	
310	If yes, how many?	----------	
311	How did you obtain it?	• It was/they were given to me for free---------- 1 • I bought it/them---------- 2 • I can t remember---------- 3 • Others ----------4	
312	Has the net (have the nets) been used in the previous two months?	• Yes ---------- 1 • No ----------2	
313	If you have no bed net what is the	• Bed nets are too expensive----------1	

	reason? (Multiple responses possible)	• Bed nets do not protect against malaria----------2 • Bed nets are not available • I am not interested in putting them on every bed-3 • I don t know how to fit the net on all the beds----4 • Only children need nets----------5 • Only adults need nets ----------6 • Don t know ----------7 • Other (please specify) ----------8	
314	Is there any net (if any) that was not used in the past two months?	• Yes ---------- 1⇨ • No ----------2	315
315	If yes what was the reason?	• nets do not prevent against malaria----------1 • the bed net was not treated with chemicals-------2 • It is too hot sleeping in a net----------3 • don t get bothered by mosquitoes----------4 • it was not a malaria transmission season---------5 • bed nets are not suitable for use----------6 • Don t know---------- 7 • Other (please specify) ----------8	
316	Can someone have malarial attack while sleeping under a net?	• Yes ---------- 1 • No ----------2 • I don't know ---------- 3	
317	For how long have you had bed nets in this house? (The oldest net if more than one)	• ----------	
318	Have any of your bed nets ever been washed?	• Yes ---------- 1⇨ • No ----------2	319
319	If yes how often did you wash your bed net(s) (the highest frequency if more than one net was washed)?	• Every day----------1 • Every week----------2 • Every month----------3 • Every year---------- 4	
320	During the previous night, who used it?	• Children <5 ---------- 1 • Children 5 – 10 ---------- 2 • Wife and Husband ---------- 3 • Other adult family member ---------- 4	
321	Do you think bed nets have any benefit?	• Yes ---------- 1⇨ • No ----------2 • I don't know ---------- 3	322
322	If yes what do you think are the benefits	• Don t get bitten by mosquitoes----------1	

	of sleeping under a bed net? (Multiple responses possible).	• Don t get malaria----------2 • Don t get bothered by other insects----------3 • It is warmer----------4 • Other: (please specify)----------5	
323	Do you think there are problems associated with sleeping under a bed net?	• Yes ----------1⇨ • No ----------2 • I don't know ----------3	324
324	If yes what are they? (Multiple responses possible)	• It is too hot sleeping under a net----------1 • Mosquitoes can still bite through the net----------2 • It is difficult if you want to get up in the night---3 • It takes time to tuck the net each night----------4 • There is not enough air----------5 • Other, specify----------6	
325	Have you ever heard about bednets treated with insecticide?	• Yes ---------- 1 • No ----------2	
326	What do you think is the reason for treating bednets? (Multiple responses possible)	• To kill mosquitoes ---------- 1 • To make the net stronger ---------- 2 • To repel mosquitoes ---------- 3 • I don't know ---------- 4 • Other (specify) ----------5	

This is the end of the interview. Thank you very much for participating in this research

Annex 3 –Questionnaire (Amharic version)

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Annex 4-checklist (English version)

Checklist for inspection of nets

Add checklists if more than one net(For houses which have at least one bed net)

House number.....

Bed net No.....

1) The bed net is□-in the packageIs h☐ed othe☐cify ☐

2) If hangedis□- On bedIs☐sleeping floor Is☐medeb ☐

3) Condition of a net that has ever been used.

3.1) Any holes on the net Yes ☐ No ☐

3.2) If yes how many.....

3.3) Size of the largest hole.....

3.4) Is there any tear?Yes ☐ ☐

3.5) If yes how many.....

3.6) Size of the largest tear.....cm

4) Any other observation pertaining to the use of the net?

(Examplecleanliness, use of the net for other purposes)

....

Annex 5-checklist (Amharic version)

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3.4) [illegible]

[illegible] ☐ ☐

3.5) [illegible] ---------------------

3.6) [illegible]

-------------------- [illegible].[illegible]

4. [illegible]

([illegible] --
