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Treated Bed Nets Utilization and Associated Factors Among Under Five Children in Lasta District, North Wollo Zone ,Amhara Region, North East Ethiopia,2022

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BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF EPIDEMIOLOGY AND BIostatISTICS
INSECTICIDE TREATED BED NETS UTILIZATION AND
ASSOCIATED FACTORS AMONG UNDER FIVE CHILDREN IN
LASTA DISTRICT, NORTH WOLLO ZONE ,AMHARA REGION,
NORTH EAST ETHIOPIA,2022

BY: ASFAW HAILU ZERIHUN (FETP RESIDENT)

**A THESIS SUBMITTED TO THE DEPARTMENT OF EPIDEMIOLOGY AND
BIostatISTICS, SCHOOL OF PUBLIC HEALTH, COLLEGE OF MEDICINE
AND HEALTH SCIENCES IN PARTIAL FULFILMENT OF THE
REQUIREMENT FOR THE DEGREE OF MASTERS IN FIELD
EPIDEMIOLOGY**

AUGUST, 2022

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AUGUST, 2022

BAHIR DAR

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Acronyms/Abbreviations

ACT	Artemisinin-Based Combination Therapy
CI	Confidence Interval
ETB	Ethiopian Birr
ENMIS	Ethiopia National Malaria Indicator Survey
FMHO	Federal Ministry Health Organization
IEC	Information Education Communication
IRS	Indoor Residual Spray
ITN	Insecticide Treated Net
NMSPs	National Malaria Survey Programs
PW	Pregnant Women
RBW	Roll Back Malaria
SKM	Square Kilo Meter
SPSS	Stastical Package for Social Science
SSA	Sub-Saharan Africa
UFC	Under -Five Children
WHO	World Health Organization

Abstract

Background: Malaria can be prevented by using insecticide treated nets and decreases malaria mortality by 55% in under -five children in Africa. Ethiopia, scaling up distribution and utilization of insecticide treated nets to cover 100% of under –five children. Utilization of insecticide treated nets has many unsolved problem like, not being hung at all, poorly hung nets, and children not being prioritized to use. This study purpose was to assess insecticide treated nets utilization and its associated factors among under -five children in Lasta district.

Methods: we conducted a community-based cross-sectional study among under-five children in Lasta district from April to May, 2022. Four study kebeles were identified by simple random sampling technique and 416 care takers with at least one under five children were selected by systematic random sampling technique. Semi-structured questionnaire was used to collect data using face-to-face interview. The data was entered into Epi data version 3.1 then exported to statistical package for social science version 25 for analysis. Pretest was conducted among 5% of sample. We used tables, frequencies, percentages, and means for descriptive analysis. Bivariable and multivariable logistic regression analysis were done. Variables with p-value <0.05 along with a 95% confidence interval (CI) were used to declared statistically significant variables. Hosmer-Lemeshow model was done.

Results: A total of 403 under-five children were participated in the study with 95.72% response rate. Of these, 137 (34%) slept under insecticide treated net during the previous night prior to the survey. Care takers who had social support from others [(AOR: 1.74, 95% CI (1.10-2.74)], who had treated net [(AOR: 3.04, 95% CI (1.07-8.63)], who had good knowledge about insecticide treated net [(AOR: 10.01, 95% CI (5.37-18.69)], Care takers who think the ITN chemical is harmful [(AOR: 0.62, 95% CI (0.39-0.99)] were significantly associated with under five children insecticide treated nets utilization.

Conclusions: Even if all have access to insecticide treated nets, only one third of the participant were utilized it. Care takers who had no social support from others, had non treated nets, had poor knowledge about insecticide treated nets and care takers who did not think insecticide treated net chemical is harmful were significantly associated factors. Thus, health education and awareness creation should be taken for those care takers to improve insecticide treated nets utilization for under-five children.

Keywords: under-five children, insecticide-treated nets, utilization, malaria, Last district

1. Introduction

1.1. Background

Insecticide-treated bed net (ITN) is a type of vector control approach and cost-effective type of malaria prevention (1). Between 2016 and 2018, a total of 578 million insecticide-treated mosquito nets (ITNs) were reported by manufacturers as having been delivered globally, with 50% going to Côte d'Ivoire, the Democratic Republic of the Congo, Ethiopia, Ghana, India, Nigeria, Uganda and the United Republic of Tanzania. In 2018 about 197 million ITNs were delivered by manufacturers, of which more than 87% were delivered to countries in sub-Saharan Africa (2).

Insecticide treated nets have been proved to reduce all causes child mortality by 14-33 percent in rural sub-Saharan Africa. ITNs have been promoted to protect the most susceptible to severe malaria, children under five (3).

Ethiopia, realizing the effectiveness, scaling up distribution and utilization of ITNs to cover 100% of under-five children (4). ITNs were widely distributed in rural area for free in order to reduce the malaria burden. As a result, the number of new bed owners has increased dramatically. A wide gap exists between coverage and utilization of ITNs in the country (5). Despite the fact that night time usage was best, some people use the net to other purpose (6).

Mosquito net ownership in itself is not synonymous with utilization especially for under-five children (7). Insecticide treated nets are helpful in lowering child mortality, parasite prevalence, and simple and severe malaria episodes (8). Insecticide-treated nets have turned into an important element of malaria prevention since the beginning of the new millennium, known to promote the dramatic decline in disease incidence and malaria-related deaths (9).

In the last decade, the majority of malaria-endemic countries have struggled to build effective national-scale continuous distribution mechanisms for ITNs (10). In Sub-Saharan Africa, half of those at risk of malaria sleep under an ITN; in 2018, 50 % of the population was protected by this intervention, up from 29 % in 2010. Furthermore, from 33% in 2010 to 57 %t in 2018, the percentage of the population with access to an ITN increased. Care takers with at least one ITN for every two individuals climbed to 72 % in 2018, from 47 % in 2010. However, this figure indicates just a slight gain over the past 3 years, and remains far from the aim of universal coverage (11).

The use of insecticide-treated nets has been the principal method of malaria control in malaria-endemic areas. Despite its relative success, gains are treated by mosquito resistance to pyrethroids (insecticides used on nets), physical and chemical deterioration of ITNs, which diminishes their efficacy, and inconsistent and inaccurate application by humans, among other problems (12).

Ethiopia's national malaria prevention policy seeks to supply one ITN for every sleeping space (approximately one net for 1.8 persons) (13). To promote universal access to ITNs have adopted policies by most malaria-endemic country (14). Ownership and utilization of mosquito nets for malaria prevention is still sub-optimal with only 62% ownership of at least one mosquito net and only 37% of children using the nets (15).

1.2.Statement of the problem

Malaria is a public health problem with 219 million cases and 435,000 malaria-related deaths globally in 2017(16). It is the number one killer of under-fives children, with one child dying every two minutes (17). Under-five children are the most vulnerable to malaria, accounting for 61 % of all malaria deaths globally(18). In African region malaria burden and deaths from worldwide accounted 88% and 90% respectively. Eighty-eight percent of all deaths in sub-Saharan Africa attributed to malaria occurring in under five children (2).

World Health Organization (WHO) has formulated different strategies to combat the high prevalence of Malaria in the world. The most commonly used methods to prevent mosquito bites are sleeping under an Insecticide Treated Net. Use of ITNs has been shown to reduce malaria case incidence rates by 50% in a range of settings, and to reduce malaria mortality rates by 55% in children aged less than 5 years in sub-Saharan Africa (18)

Despite increasing availability, ITN utilization is still limited in several area and use of ITNs decreases malaria mortality rates by 55% in under-five children in Africa. Most of sub-Saharan Africa countries use of ITNs to prevent mosquito bites. Although increased efforts to improve ITN accessibility, approximately 437,000 children still die from malaria in Africa every year (19).

The burden of malaria, its prevention and control remains a challenge despite the existence of effective technologies (3). Proper use of ITNs can contribute to 90 % of decrease in malaria and 44% of all causes of death in under-five children (20). Burden of malaria is more devastating in

children and causes a considerable amount of workdays economic cost, reduction of productivity and days missed by women and men due to malaria cases of their children (21).

In Ethiopia, approximately 52 million people (68%) live in malaria risk areas, primarily at altitudes below 2,000 meters. Under-five year children are the most vulnerable group affected by malaria(22).According to the 2018 World Malaria Report, after the increased utilization of ITNs, deaths and admissions due to malaria among under-five children decreased by 81% and 73% respectively. Malaria is one of the ten top leading causes of morbidity and mortality among under-five children in Ethiopia (23). Utilization of ITN has many unsolved problem like, not being hung at all, poorly hung nets, and children not being prioritized to use ITN.

A wide gap exists between coverage and utilization of ITNs in the country. This shows that, mosquito net ownership in itself is not synonymous with utilization especially for under-five children. Complaints of nets not being hung at all, poorly hung nets, and children not being prioritized, the problem remains unsolved, and many questions remain unanswered Increase in ITNs access (i.e. household ownership) does not necessarily translate to equal increase in utilization(7).

Under-five children are vulnerable to malaria and targeted as high priority group for ITNs distribution in the country. Therefore, care takers in targeted areas of vulnerable groups have higher chance of getting free of charge ITNs. Despite the rapid and complete coverage of ITNs distribution, reports indicated that still there is poor ITNs utilization (24).

Even though the coverage of ITN in Lasta district was 100%, a total of 1356 malaria cases were reported in 2013 Ethiopia fiscal year. Of this reported cases, 275 (20.3%) were under five children. In this district, ITN utilization for preventing malaria in under five children is not known (25). Therefore, this study was to know the utilization status of Lasta district and its associated factors among under-five children Lasta district, North Wollo Zone, North West Ethiopia.

1.3.Significance of the study

ITN can be one type of cost effective vector control approach for the prevention and elimination of malaria. However, little is known about ITN utilization and associated with the utilization in under- five years old children in the study area yet. Therefore this study finding may serve as preliminary evidence about ITN utilization among under -five children's in the district. This study finding may help to program planners and implementers' about ITN utilization and factors associated to ITN utilization among under- five children. This study finding may also help to the district health office to facilitate elimination program of malaria.

2. Literature review

2.1.Utilization of ITN in under-five children

Worldwide the targets for universal coverage with ITNs aim to achieve at least 80% coverage for ITN ownership and utilization of it (26). A study conducted in African countries showed that the utilization of ITN among under five children was range from 42% to 51 % (27).

A similar study done with Gindiri national malaria indicator survey showed that the percentage of under five children who slept under ITNs have increased steadily and substantially from 6 % to 26.7 % (28).

A study conducted in Sub-Saharan Africa also showed that 55% of the populations were slept under ITN, of which 68% of was under five children (29).

A study done in Congo showed that 68.2% of children slept under ITN the night before the interview (30). In addition, a study in Myanmar showed that 80.5% of under-five children did not sleep under an ITN last night (31).

A study conducted in Malawi showed that the rate for ITN use was 57.8% (95% Confidence interval (CI) 56.1%–59.4%) (19).A study conducted in showed that 591 (58.6%) reported that their under five children slept under the net the night prior to the survey. Less than half (41.2%) slept every night under an LLIN, while 63 (7.5%) caregivers mentioned their under -five children had never slept under the net(7).

2.2.Factors associated with ITN utilization

2.2.1. Sociodemographic factors

In a study conducted in western Kenya to assess factors affecting ITNs use the variables that had significant effect on ITNs use was age, for which a 14.5% reduction in the probability of uses was observed in children under five years of age as compared to individuals' greater than five years of age (32).

A study conducted in Ethiopia ITNs use was more common when the house is headed by a female (OR=1.92, 95% CI = 1.34 - 2.74). Some 65 (17.06%) respondents were from female-headed households. Female respondents constituted 319 (83.73%). Women who believe that it is normal to use ITNs were 1.9 times more likely to use ITN than those who did not (OR: 1.930; 95% CI: 1.645–2.265).On the other hand, that ITNs use was nearly similar for under-five children of both genders, for boys it was 65.4% and for girls 64.1%). Similarly this found that there was no significant association on gender of household head and utilization of ITNs by under-five children(22).

A study showed that in Ghana the most (92.6%) of the respondents was Christians and Similar study in Myanmar showed that one hundred and three respondents (64.4%) were Christians than Muslim(31).

Care takers that had two or three children also had a great likelihood of bed net use than in the households with four or more children (33).

Education in Ethiopia showed that a determinant of mosquito net use among vulnerable group. It leads to lack of utilization of the ITN by under-five children in Ethiopia. Children whose mothers/caretakers were literate had 59.4% less risk of malaria compared to those who had not literate(31).A study conducted in Mugisha showed that possession and use of ITNs in children with a married mother/caretakers are over 3 times as likely to sleep under a net (33).

A study conducted in Rwanda children born to a married mother/caretakers or mother living with a partner were 57% less likely (0.43 [0.36–0.52]) to sleep under a bed net compared to children born to a widowed, divorced mother (34).A study done in Ghana showed that Employed caregivers were also 1.51 times more likely to use an ITN than unemployed caregivers and there was no association (AOR=1.51, 95%CI=0.47, 4.92, p=0.490) (27)

2.2.2. ITN related factors

A study done in southeast Asia showed that the information on the utilization of ITNs, treated or untreated, is beneficial for investigating factors associated with their use, ITN are according to international targets (35).

The source of ITN for under five children was distributed by various projects implemented within the health facility catchment area, and donation by non-governmental organizations 9(2.36%) (36).

A study done in southeast Asia showed that the information on the utilization of ITNs, treated or untreated, is beneficial for investigating factors associated with their use, ITN are according to international targets (35).

A study conducted in Sub- Saharan Africa showed that high ITN coverage rates following free bed nets distribution were previously reported in the Congo and elsewhere including Sierra Leone (87.6%), Ethiopia (91.0%), and Togo (96.7%). The majority of 30 (60%) of respondents have ITN while 20 (40%) of respondents have not ITN all households (37).In a study done in Ghana showed that the majority (80.6%) owned ITNs and 41.7% of them slept under the ITNs with their children the night before the survey one(5).

A study conducted in Amhara and Oromia regions shows that ‘conical’ shaped nets were more preferred than ‘rectangular’ shaped ones (OR=2.27 (95% C.I=1.10-4.68). These studies showed that type of ITN are important determinants for prevention and control of malaria among under-five children (38). A study showed in Shewa Robit town 20% of study participants said that using mosquito net was not comfortable because of becoming hot during sleeping and its bad smell. This shows the fear of discomfort may hinder utilization of mosquito nets by under-five children (8).

2.2.3. Knowledge related factors

A study conducted in Ghana showed that lack of access to ITNs and poor knowledge and perception on ITNs and malaria have been previously reported as important barriers to the use of ITNs in parts of Africa. However, access does not always result in usage due to sociocultural and logistical reasons. Evidence from some parts of Ghana has shown that over 40% of ITNs available in the households go unused (27).

A study done in Western Kenya showed that a wide gap exists between coverage and utilization of ITNs in the country. This shows that, mosquito net ownership in itself is not synonymous with utilization especially for under-five children (34).

A study done in West Gojjam zone , Mihrab Abaya Gamo Gofa Zone and Itang, Gambella zone which showed that 72% have poor knowledge to use ITN (AOR=0.28, 95% CI 0.15-0.53) among caregivers aged 36 and above, 82.7% owned an ITN and 39.4% of them slept in it the night before the survey (18).

A study conducted in Nigeria showed that chemicals used to treat the nets were thought to be harmful to adults, children and pregnant women especially affecting breathing a fact that is also reported here as suffocation. As expected, adult child caregivers make decisions to protect their children from adverse reactions emanating from the use of ITNs (39).

Study conducted in East belesa District showed that 202 (27.9%) of the respondents had low levels of knowledge. A majority (82%) of the respondents knew that mosquito bites are causing malaria(40).

According to the study in sierra Leon that approximately 10.0% of caregivers didn’t know that malaria parasites can be transmitted through mosquito bites(41).A similar study found in Ghana a statistically significant relationship between ITN knowledge and use ($P=0.002$; AOR=1.39, 95% CI=0.25-7.56). Those who were knowledgeable about ITNs were found to be more likely to

use them than those who were not(42). Knowledge of malaria in a large sample of residents in Zambia and Zimbabwe was good, and knowledge of the protective efficacy of ITNs was associated with bed net use (43).

On the contrary a study in Afar Region identified that women who got information about malaria and ITNs had positive attitude towards ITNs than those who had not received mothers/care takers (AOR=0.406: 95% CI 0.26-0.63). knowledge of the cause of malaria were associated with the use of ITNs, but the association was border line (44). A study done in Moqudisho showed that the majority of the respondents believed there is a clear benefit of ITNs uses shows that 46 (92%) said yes, 2 (4%) said no and 2 (4%) said don't know (37).

A Study conducted in Nigeria showed that care givers who had good knowledge 476(62.1%) were 1.8 times more likely (AOR= 1.8, 95% CI; 1.4 – 2.5) to utilize ITN for under five year children (35).

2.2.4. Intra-household characteristics

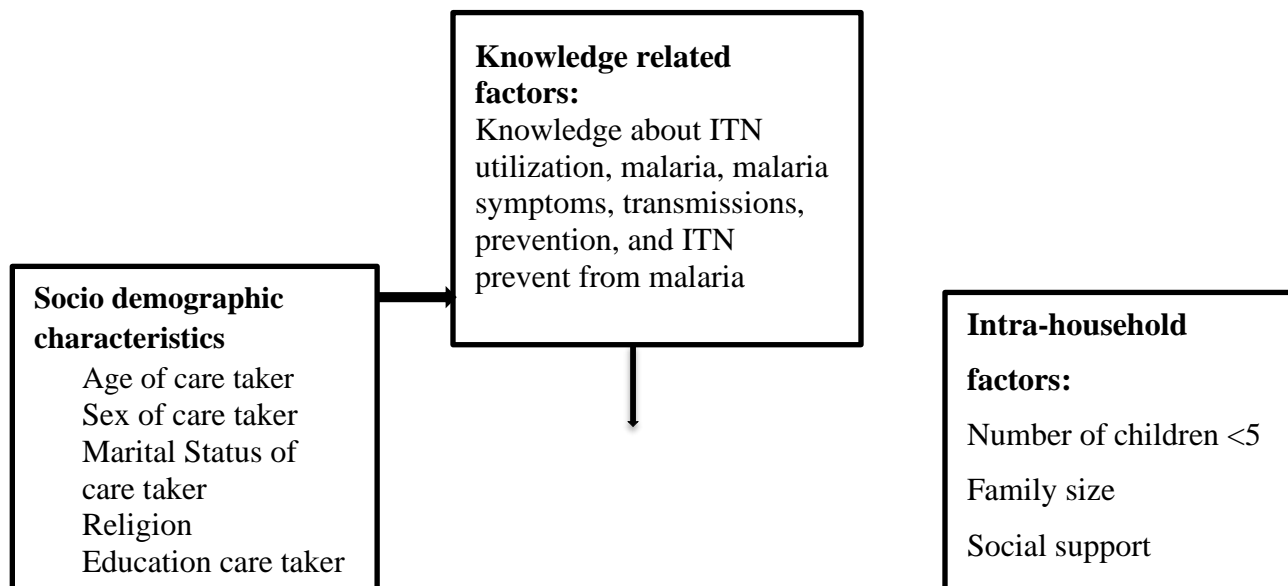
There are factors that determine net ownership and usage by members sleeping within the household. These factors affect effective utilization of ITNs by household members including children under five. In the larger sample, the addition of one household member reduces the likelihood of a child sleeping under a net by 17%. This is contrary to the results in which possession was the dependent variable (45).

A study in south west Nigeria showed that Children from households with 1-3 members (AOR= 2.29, CI= 1.45-3.63, p= 0.001) and 4-6 members (AOR= 1.50, CI= 1.04-2.15, p= 0.03) were more likely to sleep under an ITN than children from households with 7 and above members. Care takers that had two or three children also had a great likelihood of bed net use than in the households with four or more children (33) Children from Osun (AOR= 0.49, CI=0.27-0.87, p= 0.016), Ekiti (AOR= 0.34, CI= 0.19-0.60, p= 0.001) and Lagos states (AOR= 0.49, CI= 0.26-0.90, p= 0.022) were less likely to sleep under an ITN than those from Ogun Stateew (46).

A study done in Mpanda showed that Children under five use of any net by children under five in Mpanda was higher (84%) compared to (56%) in Kisarawe (OR: 6.25, p < 0.001) (32). According to a study conducted in Sub-Saharan Africa, by 2019, 68 % of households had at least one ITN. The percentage of the population sleeping under an ITN increased significantly for the whole population (from 2% to 46%) and for children under -five (from 3% to 52%) (47). A study done in Tanzania showed that an increase of 10 % ownership of at least one mosquito net at

household level is associated with 12 % and 10 % decrease of malaria risk for all age and under-five children per year, respectively (48).

3. Conceptual framework



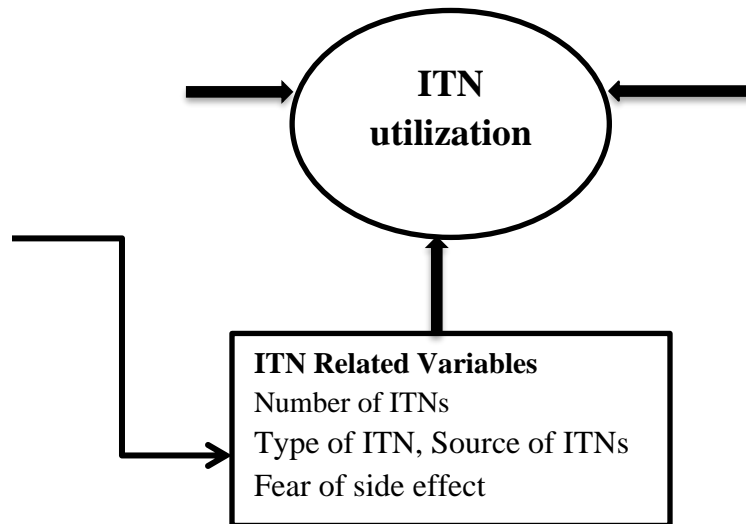


Figure 1. Conceptual framework adopted from different literature

4. Objective

4.1. General objective

- To assess the utilization of ITNs and its associated factors among under-five children in Lasta district, North Wollo zone, Amhara region, Ethiopia April to May, 2022.

4.2. Specific Objectives

- To determine the level of utilization of ITNs among under five children in Lasta district, North Wollo zone, Amhara region, Ethiopia April to May, 2022.
- To identify factors affecting utilization of ITN among under-five children in Lasta district, North Wollo zone, Amhara region, Ethiopia April to May, 2022.

5. Methods and materials

5.1. Study design, area and period

A community-based cross-sectional study was conducted from April 1 to May 30, 2022 in Lasta district. Lasta district is one of the districts in North Wollo zone of the Amhara region, Northern Ethiopia. Lalibella is a town of Lasta district. The town is situated 701 km away from Addis Ababa, 305 km away from regional town Bahir Dar, and 180 km away from Zonal town Woldia. Lasta district is bounded; on the South by Meket district, on the West by Bugna district, on the North by Waghumra special zone, and on the East by Gidan district. The district has a total of 26 kebeles. The rainfall ranges between 4200 to 1600 millimeters per year. The total population of district is 142,965. Of which 90,897 (63.58 %) population is living in malaria-risk areas. There are 8 health centers, 27 health posts, and 1 private clinic in the district.

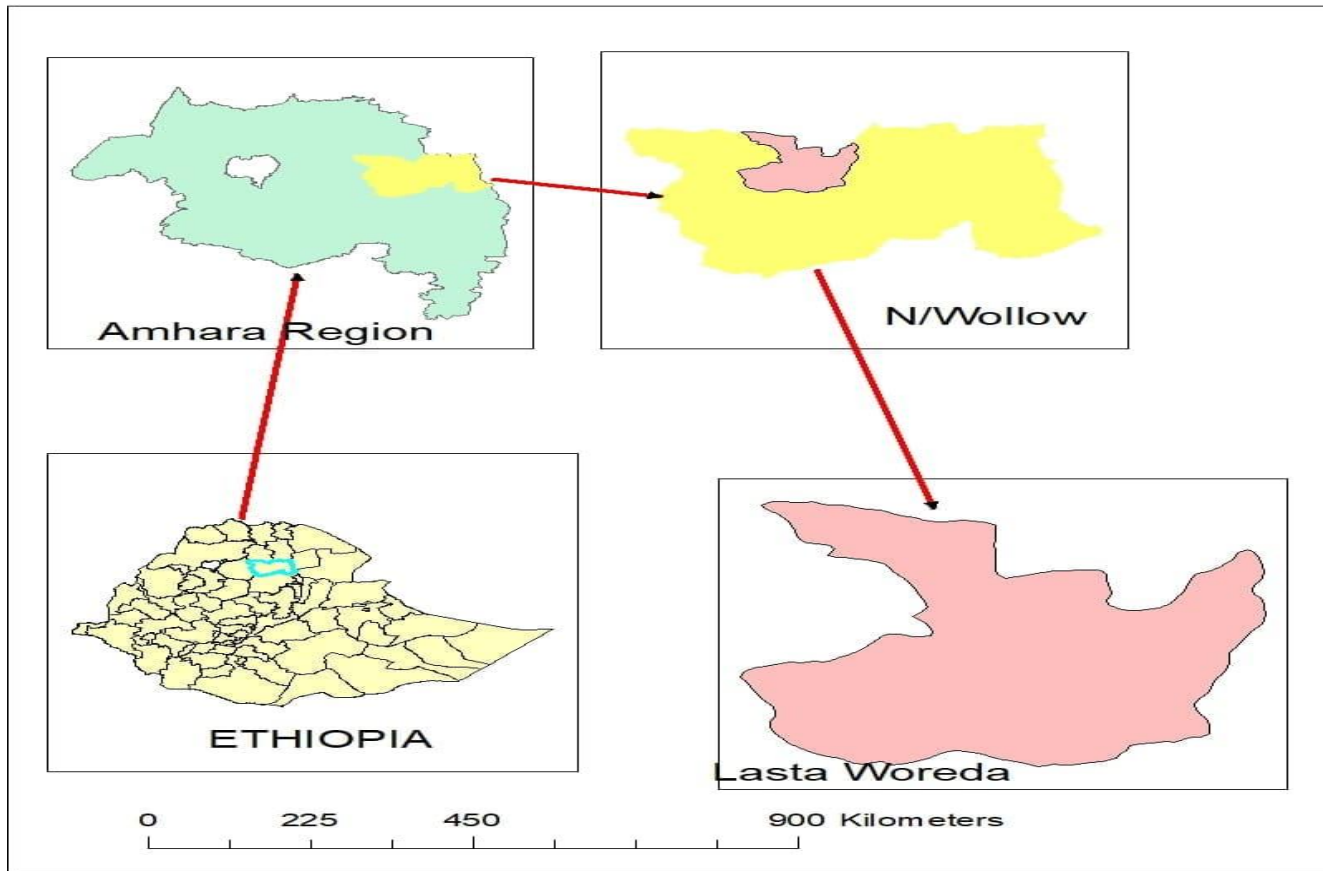


Figure 2. Map of Lasta district, North Wollo, Amhara region, 2022

5.2. Source and study populations

5.2.1. Source population

All under-five children who have resided in all kebeles of Lasta district were the source population

5.2.2. Study population

All under-five children who have resided in the four selected kebeles of Lasta district were the study population

5.3. Inclusion and Exclusion criteria

In this study, under-five children who have resided in the selected kebeles of the Lasta district were included. Besides, those under-five children who had non-resident care takers (i.e. who have resided for < 6 months) were excluded as people who have resided for < 6 months in a given administrative unit are not officially recognized as residents.

5.4. Sample size determination

For specific objective 1: The sample size was determined using single population proportion formula for the proportion (p) of ITN utilization of children slept under ITN in the previous night prior to the survey in East Belesa district, Amhara region (56.5%) taken from a previous study (40). Assuming, level of significance 95%, 5% margin of error. The sample size of the study was computed using Epi-info Version 7.1.

$$n = Z^2 \alpha / 2 p (1-p) / d^2, \text{ Where } Z=1.96 \quad p =0.57 \quad d=0.05$$

$$= (1.96)^2 * 0.57(1-0.57) / (0.05)^2$$

$$= (0.9416) / 0.0025 \quad \underline{\underline{=378}}$$

The final sample size with 10% non-response rate was 416.

For specific objective 2: Sample size was calculated for the associated factors based on the following assumptions. A 95% level of confidence, 80% of power to detect real association of exposure variable and exposed to unexposed ratio each variable. To determine the sample size frequency of exposure variables Age, Education, Family sizes were taken from different literature. Epi info software was used to determine sample size of each factor by using each odds ratio. We were taking the factors that have an association with ITN utilization from previous studies done in Ethiopia. The factors were summarizing by the following table.

Table 1. Sample size determination for associated factors using Epi-info STATCAL: cross-sectional, Flessis for the study done in Lasta district, Amhara, Ethiopia, 2022

Variable	Categories	Variable (exposed)	Variable (unexposed)	AOR	%of ITN	Utilization among exposed	% of ITN utilization	Among unexposed	Calculate Sample size	Non-response rate (10%)	Total sample size	Reference
Age	31–44years	11	217	0.05	(40%)		(5%)		151	161	161	(24)
Family size	≤5 families	122	41	11.23	(75 %)		(6%)		59	65	65	(24)
Education	No education	200	575	3.1	(25%)		(26%)		132	145	145	(29)

5.5. Sampling technique

Among the nineteen malarious kebeles identified, 4(20%) of the malarious kebeles was selected randomly by lottery simple random sampling method. The total number of under-five children with care taker in each kebele was obtained using the family folder registration as a sampling frame in the community health information system of the kebeles in the health post. We used the proportional allocation to select study participants from selected kebeles. To select each study unit systematic random sampling method was used. The K^{th} were calculated for Kebele Gelesot, Erfa, Dibko and Ayedefer were 4, 6, 4, and 3 respectively. The first study participant was selected randomly from each Kebele.

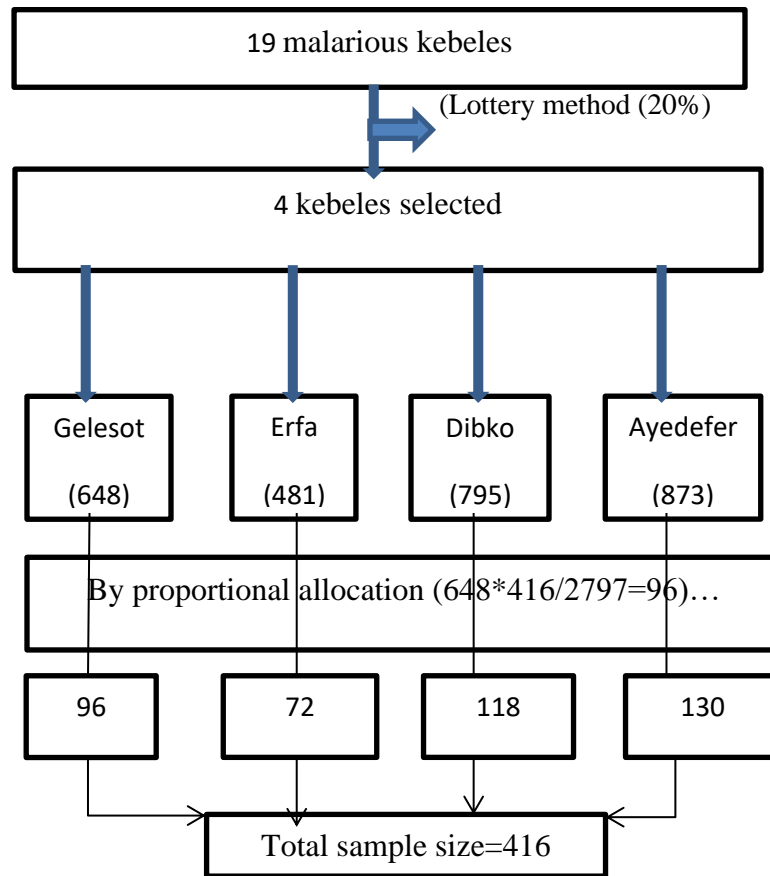


Figure 3. Schematic presentation of sampling procedure to select study subjects from Last district, North Wollo zone, Amhara, Ethiopia, 2022.

5.6. Variables of the study

5.6.1. Dependent variable

- The outcome variable was ITN utilization of under- five children (utilized, not utilized).

5.6.2. Independent variables

Socio-demographic characteristics:

- Care taker age, sex
- Education,
- Occupation, marital status and religion

Knowledge related factors: Knowledge of malaria, malaria symptoms, transmissions, prevention, and ITN prevent from malaria

ITN related variables:

- Type of ITN, source of ITN, and number of ITN observed, fear of side effect.

5.7. Operational Definitions

ITN utilization :A child who was reported to have slept under ITNs during the night prior to the survey date (24).

Caretaker: - A family member who regularly looks after a child under the age of five.

Good knowledge:- of the seven asked knowledge questions, who answered five and above questions correctly (scored 70% and above) (49).

Poor knowledge:- those who scored below 70% of the score value of the knowledge measuring question (49).

5.8. Data collection methods and procedure

A semi-structured questionnaire was used for data collection. Data were collected by a combination of face-to-face interview and observation. The data collectors and supervisors were trained for two days by the principal investigator. We recruited four diploma nurses as a data collector and two health officers as supervisors. ITN use was cross checked with the interview response of caretakers, through direct observation. The supervisors and principal investigator were assigned to supervise the data-collection process.

Data collection tools contain information on the socio-demographics factors, intra-household factors, Knowledge related factors, and ITN related variables.

5.9. Data Quality control

The questionnaire was prepared originally in English and translated to Amharic and back to English to check the quality of the questions. Pre-test was conducted the total sample size to ensure that the questionnaires were free from ambiguity and that the data generated was meaningfully analyzed. It was done by administering the questionnaire in one of neighboring Kebele named Shallo, located 35 Kms from the study area. The principal investigator supervised the overall data collection process. On a daily basis, both data collectors and supervisors were received feedback on the previous day's operations.

5.10. Data processing and analysis

Data were cleaned, coded, and entered into Epi data version 3.1 then export to SPSS version 25 for statistical analysis. Descriptive statistics were used to summarize and present the socio-demographic, intra-household factors, Knowledge factors, ITN related variables. The results were presented by text and in the form of tables using frequencies and percentages. Bivariable logistic regression analysis was used to identify factors which has a p- value of less than 0.25 and

considered for multivariable logistic regression analysis. A p-value of less than 0.05 with a 95% confidence interval in multivariable logistic regression analysis was considered as statistically significant factors. The Hosmer–Lemeshow goodness-of-fit was used to test model fitness (With a p-value of 0.06).

5.11. Ethical consideration

Ethical clearance was obtained from the Institutional Review Board of Bahir Dar University's College of Medicine and Health Science's school of public health department of Epidemiology and Biostatistics. Support letter was obtained from North Wollo zone, Lasta district health office, and from selected kebeles authority. Verbal consent was obtained from the participants care taker. Participants had the right to refused to participate in this research and they have been full right to withdraw from the interview at any time they wish. Finally, participant's identity was kept unknown throughout the data collection and analysis process.

5.12. Dissemination of findings

The finding of this study was submitted to the department of public health, Bahir Dar University college of Medicine and Health Sciences School of Public Health Department of Epidemiology and Biostatistics and North Wollo zone health department, Lasta district health offices and administrators at Lasta district.

6. Results

6.1. Sociodemographic characteristics of care takers

A total of 403 caretakers with under-five children were participated in the study with 95.72% response rate. Three hundred two (75%) of the caretakers were females. The mean age of the caretakers was 35 years. A total of 229 (56.8%) participants were unable to read and write (details shown below in Table. 2).

Table 2. Socio demographic variables of care taker with under-five children in Lasta district, North Wollo Zone, Amhara, Ethiopia, 2022

Variables	Category	Frequency (%)
Sex of care taker	Female	302(75)
	Male	101(25)
Age of caretaker	18-24	7(2)
	25-32	180(45)
	>32	216(53)
Educational status of care taker	Unable to read and write	229(56.8)
	able to read and write	118(29.3)
	Primary	20 (5.0)
	Secondary	23 (5.7)
	Above secondary	13 (3.2)
Religion	Orthodox	364 (90.3)
	Muslim	39 (9.7)
Marital status	Married	352 (87.0)
	Divorced	35 (9.0)
	Widowed	11 (3.0)
	Single	5 (1.0)
Occupation of care taker	Farmer	276 (68.5)
	House Wife	103 (25.6)
	Student	7 (1.7)
	Unemployed	9 (2.2)
	Daily Laborer	8 (2.0)

6.2. Utilization of ITN in children under five

A total of 137(34%) at 95% CI (29-39.2) under five children were slept under ITN during the night preceding the survey. The number of ITNs of reported 403, observed 304 by data collectors and hanged over the bed 137 had great variation in number.

6.2. Intra-household characteristics

A total of 81 (20.0%) care takers had only one separate bed room. About 382 (86.3%) of care takers had two or more sleeping spaces. Four hundred three (100%) of the caretakers had ITN in their house (details shown below in the table 3).

Table 3. Intra-household characteristics in Lasta district, North Wolo zone, Amhara, Ethiopia, 2022.

Variables	Categories	Frequency (%)
Number of under five children	1	185 (45.9)
	≥ 2	223 (55.3)
Family size	1-4	190 (46.0)
	5-7	195 (48.0)
	≥ 8	19 (0.02)
Number of sleeping space	One	81 (20.0)
	Two	287 (71.0)
	Three and above	35 (9.0)
Number of ITN in the House	1	198 (49.1)
	2	187 (46.4)
	≥ 3	18 (4.5)
Social support to under five	Yes	166 (41.2)
	No	237 (58.8)

6.3. Knowledge related factors

Overall, a total of 280 (70.0%) under five children's care taker had good knowledge related to ITN utilization. Care takers who had known ITN used prevent from malaria were 108 (26.8%). One hundred thirty seven (34%) of under-five children's care takers had ever heard about ITN (details shown below in the table 4).

Table 4. Knowledge related factors related to ITN utilization in Lasta district, North Wollo zone, Amhara, Ethiopia, 2022

Variables	Frequency (%)
Knowledge about ITN utilization	280 (70.0%)
Knowledge of malaria	403 (100%)
Malaria symptoms	360 (89.3%)
Transmissions	108 (26.5%)
Prevention	403 (100%)
Ever heard about ITN	137 (34%)
ITN prevent from malaria	108 (26.8%)

6.4. Factors associated to utilization of ITN in under- five children

For the analysis of bivariable logistic regression, twelve variables to ITN utilization among under-five children were considered. Variables with a p-value of less than 0.25 in the bivariable logistic regression analysis were nominated for the final multivariable logistic regression analysis. For the analysis of multivariable logistic regression seven variables were considered and analyzed.

The odds of care takers who had social support were 2 times more likely (AOR: 1.74, 95% CI (1.10-2.74)) utilized the ITNs for under-five children as compared to those who had not social support. The study also showed that the odds of utilization of ITN was 3.04 times more likely higher among care takers who had treated ITN than who had non- treated ITN (AOR: 3.04, 95% CI (1.07-8.63)).

The odds of care takers who had good knowledge were 10 times more likely utilized ITNs for their children as compared to who had poor good knowledge (AOR: 10.01, 95% CI (5.37-18.69)). The odds of care takers who think the ITN chemical is not harmful were 38% less likely utilized for their children as compared to than who think the ITN chemical is harmful (AOR: 0.62, 95% CI (0.39-0.99)).

Table 5. Bivariable and multivariable logistic regression analysis of variables for utilization of ITN among under-five children in Lasta district, North Wollo, Amhara, Ethiopia, 2022.

Variables	Utilization of ITN		Bivariable analysis	Multivariable analysis	
	utilized	Non-utilized	COR (95% CI)	AOR (95% CI)	P-value
Sex of care taker					
Male	68 (25.6%)	33 (24.1%)	1.08 (0.57-1.49)		
Female	198 (74.4%)	104 (75.9%)	1		
Religion of care takers					
Orthodox	23 (8.6%)	16 (11.7%)	0.72 (0.37-1.41)		
Muslim	243 (91.4%)	121(88.3%)	1		
Partner discuss utilization ITN					
Yes	210 (78.9%)	90 (65.7%)	1.96 (1.24-3.10)	2.12(1.19-3.81)	0.37
No	56 (21.1%)	47 (34.3%)	1	1	
Ever talked importance of sleeping under an ITN					
Yes	65 (24.4%)	54 (39.4%)	0.53(1.29-3.13)	0.77(0.43-1.39)	0.38
No	201(75.6%)	83 (60.6%)	1	1	
Social support from others					
Yes	74 (54.0%)	92 (34.6%)	2.22 (1.46-3.38)	1.74(1.10-2.74)	0.04 [¥]
No	63 (46%)	174 (65.4%)	1	1	
Insecticide used in ITN is harmful					
Yes	107 (40.2%)	80 (58.4%)	0.48 (0.32-0.73)	0.62 (0.39-0.99)	0.0001 [¥]
No	159 (59.8%)	57 (41.6%)	1	1	
ITN hanged properly					
Yes	51(37.2%)	67 (25.2%)	1.76 (1.13-2.74)	1.27(0.72-2.24)	0.42
No	86 (62.8%)	199 (74.8%)	1	1	
What type of ITN do you have					
Treated	259 (97.4%)	114 (83.2%)	7.47 (3.11-17.89)	3.04 (1.07-8.63)	0.0001 [¥]
Non-treated	7 (2.6%)	23 (16.8%)	1	1	
Knowledge about ITN					
Good	121(88.3%)	124 (46.6%)	8.66 (4.88-15.38)	10.01(5.37-18.69)	0.0001 [¥]
Poor	16 (11.7%)	142 (53.4%)	1	1	

¥p-value < 0.05 were declared statistically significant variables

7. Discussions

This study was conducted to determine ITNs utilization and its associated factors among under-five children of Lasta district. In this study a total of ITN utilization among study subjects in the district was 34 % .This study was lower than the studies done in Sub-Saharan Africa slept under ITNs which is 68 % of them being children under the age of five (29). A study done in Congo showed that the caretakers' of children under five reported that 68.2% of children slept under ITN the night before the interview (30).This finding also different from the study conducted in Malawi which had the rate for ITN use was (AOR:57.8% ,95 %CI (56.1%–59.4%). This difference might be due malaria prevention or elimination strategic activities based on context of the country, geographical and demographic settlement of the community, climatically variations. The odds of care takers who responded that insecticide used in ITN was harmful for under-fives children were 38% less likely (AOR=0.62, 95%CI: 0.39-0.99) not to utilize an ITN as compared to those who said insecticide used in ITN was not harmful. Study conducted in India Ho municipality. The odds of caretakers who responded that ITNs have side effects were 49% times less likely (AOR:0.37, 95%CI (0.22- 0.61) to use an ITN as compared to those who responded had said not harmful (50). This difference might be due to gap of knowledge about ITN, educational status of the caretakers.

There was an association between ITN use and social support for children under five. The odds of care takers who had social support for children under the age of five were 2 times more likely(AOR:1.74,95CI (1.10-2.74) to utilize an ITN compared to those who said that social support had not influence ITN utilization among children under the age of five. This might imply that caregivers had good awareness about ITN utilization for under- five year children(51). The ITN utilization among children under five caretakers who did use treated ITN were 3 times more likely (AOR: 3.04 95%CI: 1.07-8.63) to utilize ITN for their children. This might imply they may think treated ITN is effective to prevent mosquito bite, due to effect of its chemical relative to non -treated ITN.

This study showed that the overall good level of knowledge among care takers was 245(60.8%), whereas 158(39.2%) had poor knowledge about ITN utilization. The good knowledge of caretakers were 10 times more likely (AOR:10.01, 95%CI:5.37-18.69) to utilize ITN for their children when compared to study conducted in Nigeria which showed that 476(62.1%) of care takers had good knowledge about ITN utilization(35).The care takers had nearly similar

knowledge level about ITN utilization. This might be due to usage of similar method of study design and variables used. When compared to study conducted in East belesa District showed that 202 (27.9%) of the respondents had low levels of knowledge(40). This discrepancy might be due to the difference in variables, climatically condition and other geographical reasons.

8. Limitations of the study

This was a cross-sectional study, representing the snapshot of the population within the study period and does not show cause and effect since the independent and outcome variables were measured simultaneously. Data was collected through reporting and thus there was a possibility of recall bias. In this study, however, respondents were required to only recall care taker with under -five children slept under an ITN in the previous night.

9. Conclusions

In the study, the overall utilization of insecticide treated nets by under-fives was low despite the high proportion availability of ITN within the Households with under five children. Besides, even some households with ITN weren't using them consistently. Care takers who had no social support from others, had non treated nets, had poor knowledge about insecticide treated nets and care takers who did not think insecticide treated net chemical is harmful were significantly associated factors.

10. Recommendations

Based on the findings of the study we recommended to:

- Lasta district health office with the respective health care providers should improve ITN utilization to under-five children in the district
- The health care professionals such as health extension workers and health professionals should improve the knowledge of care takers related to ITN utilization
- The family should strengthen the social support of care takers for their children to increase utilizing of the ITN
- Health workers should give awareness to those care takers as insecticide chemical is not harmful for the health of under five children

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12. Annexes

Annex 1. English version of participant’s consent form

Questionnaires Insecticide Treated Bed Nets (ITNs) utilization and associated factors among under- five years old children in Lasta district, North Wollo zone Amhara, Ethiopia, 2022.

Questionnaire ID Number_____

District Name _____Kebele name_____

Section.1.GeneralInformation

Hello. My name is ----- and I am part of a team of people who are carrying out a survey on “Assessment of utilization of ITNs and association factor among households with under five children for malaria control in Lasta District” (Show a letter of approval from DHO). We would very much appreciate your participation in this survey. We would like to ask you some questions and it will take about 25 minutes. Your answers will remain confidential, and we will not be taking down your name or address, so your answers will be anonymous. Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions. However, we hope that you will participate in this survey since your views are important. At this time, do you want to ask me anything about the survey? May I begin the interview now? Start time____ End time____ Date____/____/____ Respondent agrees to be interviewed.....Care taker does not agree to be interviewed-----

END

Annex 2. English version of participant's questionnaires

No_	Question	Response	Skip
I. Socio-demographic factors			
101	Age of care taker	-----in years	
102	sex of care taker	1) Male 2) Female	
103	Educational status of care taker	1)Unable to read and write 2)Able to read and write 3)Primary 4)Secondary 5)above	
104	Occupation	1)Farmer 2)House wife 3)Student 4)Unemployed 6)Daily laborer 7)Government employee 8)Merchant	
105	What is your marital status?	1) Married 2) Single 3) Divorced 4)Widowed	
106	Religion	1) Orthodox 2)Muslim	

II	Intra-household factors		
201	How many children below 5 years live this household?	1) One 2) Two 3) Three 4) More than three	
202	Number of people live in this household?	-----	
203	How many sleeping spaces are there in this household?	1) one 2)Two 3) Three 4) Four 5) Five 6) More than five	Observe
204	How many sleeping rooms were ITNS hanged?	_____	observe
III	Knowledge related factors		
301	Do you know how to hang the ITN	1)Yes 2)No	
302	Do you know malaria transmission	1)Yes 2)No	
303	If yes, what are the main Transmition	-----	
304	do you know sign an symptom of malaria	1)Yes 2)No	
305	Have you Ever heard about ITNs use	1)Yes 2)No	
306	Do you know ITNs are necessary in preventing malaria among under-fives	1)Yes 2)No	

	year		
307	Do you think that malaria is caused other than mosquitoes bite	1)Yes 2)No	
308	Do you know the use of treated and Non treated ITN	1)Yes 2)No	
309	Do you think that social support network determines bed nets use for children under- five years?	1) Yes 2) No	
310	Have you ever been you and your partner discusses about ITN use for children under five years?	1)Yes 2)No	
IV	ITN related factors		
401	Do you have ITNs in the house	1.yes 2.No	If No, skip Q.402
402	If yes, How many ITNs do you have?	1)One 2)Two 3)Three 4)above three	
403	What type of ITN do you have?	1)Treated ITN 2)Non-treated ITN	
404	Source of ITN	1) Support from any organization 2)Support from Family 3)Paid	
405	Utilization of ITN in under five	1)Yes 2)No	

Annex 3.Checklist for direct observation

S.No	Category	Response
405	Number of beds or places of sleep	1)One 2)Two

		3)Three and above
406	Number of beds /places of sleep observed with bed nets	1)One 2)Two 3)Three and above
407	Number of bed nets observed in the household	1) One 2) Two 3)Three and above
408	The type of bed net that household owned	1)Re- treatable 2)Permanently treated
409	Is the bed net hanged(placed) properly over the bed or sleeping area	1)Yes 2)No
410	Is there any hole(throne) in the bed net	1)yes 2)No

Annex 4.Amharic version of participant's consent form

አባሪ 1. የተሳታፊ ስምምነት ቅጽ

የወባ በሽታ መከላከያ በሆነው በአልጋ አጎበር አጠቃቀም እና ተዛማጅ ምክንያቶች ዙሪያ ከአምስት ዓመት በታች ለሆኑ ሕፃናት ቤተሰቦች የተዘጋጀ መጠይቅ በላስታ ወረዳ፣ ሰሜን ወሎ ዞን፣ አማራ ፣ ኢትዮጵያ ፣ 2021

የተሳታፊ መታወቂያ ቁጥር _____ የወረዳ ስም _____ የቀበሌ ስም _____

ክፍል. 1. አጠቃላይ መረጃ

ሰላም። ስሜ -----ይባላል። እና እኔ የወባ በሽታን ለመቆጣጠር ከአምስት ዓመት በታች በሆኑ ህፃናት ባላቸው ቤተሰቦች መካከል የአልጋ አጎበር አጠቃቀም ላይ ጥናት ለማድረግ የመጣሁ ነኝ። በላስታ ወረዳ” (ከ ጤና ጽ/ቤት የድጋፍ ደብዳቤን ያሳዩ)። በዚህ የዳሰሳ ጥናት ውስጥ ተሳትፎዎን በጣም እናደንቃለን። አንዳንድ ጥያቄዎችን ልጠይቅዎት እና ወደ 25 ደቂቃዎች ያህል ይወስዳል። መልሶችዎ ሚስጥራዊ ሆነው ይቆያሉ ፣ እና እኔ ስምዎን ወይም አድራሻዎን አንፈልግም ፣ ስለዚህ መልሶችዎ ስም -አልባ ይሆናሉ።

በዚህ የዳሰሳ ጥናት ውስጥ መሳተፍ በፈቃደኝነት ላይ የተመሠረተ ሲሆን ማንኛውንም የግለሰብ ጥያቄ ወይም ሁሉንም ጥያቄዎች ላለመመለስ መምረጥ ይችላሉ። ሆኖም ፣ የእርስዎ አስተያየት አስፈላጊ ስለሆነ በዚህ የዳሰሳ ጥናት ውስጥ እንደሚሳተፉ ተስፋ እናደርጋለን።

በዚህ ጊዜ ስለ ዳሰሳ ጥናቱ ማንኛውንም ነገር ሊጠይቁኝ ይፈልጋሉ? አሁን ቃለ መጠይቁን ልጀምር? የመነሻ ሰዓት _____ የማብቂያ ጊዜ _____ ቀን ____/____/____ ተጠሪ ቃለ መጠይቅ ለማድረግ ተስማማ
ተጠሪ በቃለ መጠይቅ አይስማማም ----- መጨረሻ።

ተቋቁ	መጠይቅ	ምላሽ	ዝላል
ስነ ህዝባዊ መረጃ			
101	የአሳድጊ ወይም የወላጅ እድሜ	-----በአመት	
102	የአሳድጊ ወይም የወላጅ ፆታ	1) ወንድ 2) ሴት	
103	የአሳድጊ ወይም የወላጅ የት/ት ደረጃ	1)መፃፍና ማንበብ የማይችል 2)መፃፍና ማንበብ የሚችል 3)አንድኛ ደረጃ 4)ሁለተኛ ደረጃ 5)ከሁለተኛ ደረጃ በላይ	
104	የስራ ድርሻ	1)አርሶ አደር 2)የቤት እመቤት 3)ተማሪ 4)ስራ አጥ 6)ቀን ሰራተኛ 7)የመንግስት ሰራተኛ 8)ነጋዴ	

105	የጋብቻ ሁኔታ ?	1) ያገባ 2) ያላገባ 3) የፈታ 4) የሞተባት/በት	
106	ሃይማኖት	1) ኦርቶዶክስ ተዋህዶ 2) ሙስሊም	
II	የቤት ውስጥ ባህሪያት መጠይቆች		
201	ስንት ከአምስት አመት በታች ህፃናት አሉ?	1) አንድ 2) ሁለት 3) ሶስት 4) ከሶስት በላይ	
202	በቤቱ ውስጥ ስንት ሰው ይኖራል ?	-----	
203	ስንት የመኝታ ቦታዎች ወይም ክፍሎች አሉ?	1) አንድ 2) ሁለት 3) ሶስት 4) አራት 5) አምስት 6) ከአምስት በላይ	

204	ከስንቱ የመኝታ ክፍሎች አጎበር በአግባቡ ተሰቅሏል?	_____	
III	ስነ ባህሪያዊ መረጃዎች		
	የአሳዳጊ ወይም ተንከባካቢ እውቀት መረጃ		
301	የአልጋ አጎበር እንደት እንደሚሰቀል አውቃሉ?	1)አዎ 2)የለም	
302	የወባ መከላከያ መንገዶችን ያውቃሉ?	1)አዎ 2)የለም	
303	ካወቁ ምን ምን ናቸው	-----	
304	የወባ በሽታ ምልክቶችን ያውቃሉ?	1)አዎ 2)የለም	
305	ስለ አልጋ አጎበር ሰምተው ያውቃሉ?	1)አዎ 2)የለም	
306	የአልጋ አጎበር የወባ ትንኝን ይከላከላል ብለው ያስባሉ?	1)አዎ 2)የለም	
307	የወባ በሽታ በወባ ትንኝ አማካኝነት የሚመጣ ነው ብለው ያስባሉ?	1)አዎ 2)የለም	
308	የታከመ የአልጋ አጎበርና ያልታከመ አጎበር ጥቅምን ያውቃሉ?	1)አዎ 2)የለም	
	የአሳዳጊዎች ወይም ተንከባካቢዎች አመለካከት		

313	ህፃናትን አጎበርን በእግባቡ እንድጠቀሙ የእርሳዎን እርዳታ ይፈልጋሉ ብለው ያስባሉ?	1)አዎ 2)የለም	
314	እርሳዎና ቤተሰብዎ ስለ አጎበርና አጠቃቀሙ ተመካክረው ያውቃሉ?	1)አዎ 2)የለም	
IV	አጎበር አጠቃቀምን በተመለከተ መጠይቆች	1)አዎ 2)የለም	
401	ከቤትዎ የአልጋ አጎበር አለዎት	1)አዎ 2)የለም	
402	ካልዎት ምን ያህል ነው?	1) አንድ 2) ሁለት 3) ሶስት 4) ከሶስት በላይ	
403	ምን አይነት የአልጋ አጎበር አለዎት ?	1.የታከመ 2.ያልታከመ	
404	ከዩት አገኙት	1. ከመንግስት 2. ከቤተሰብ 3. በግዥ	
405	ከአምስት አመት በታች ያለ ህፃን አጎበር ተጠቅሟል?	1.አዎ 2.የለም	

Annex 3. የምልከታ መጠይቆች

S.No	ጥያቄ	ምላሽ
405	የመኝታ ክፍሎች ወይም ቦታዎች	1) አንድ 2) ሁለት 3) ሶስትና ከዚያ በላይ
406	የአልጋ አጎበር የተሰቀለባቸው የመኝታ ቦታዎች ወይም መኝታዎች	1) አንድ 2) ሁለት 3) ሶስትና ከዚያ በላይ
407	በቤት ውስጥ ያለ ጠቅላላ አጎበር	1) አንድ 2) ሁለት 3) ሶስትና ከዚያ በላይ \
408	የአልጋ አጎበር ዐይነት	1) ሊታከም የሚችል 2) የማይታከም
409	የአልጋው አጎበር በትክክል ተሰቅሏል ወይ	1) አዎ 2) የለም
410	የአልጋ አጎበር የተቀደደ ነገር አለው ወይ	1) አዎ 2) የለም



ባሕር ዳር ዩኒቨርሲቲ
 ሕክምና እና ጤና ሳይንስ ኮሌጅ
 የሥነ - ምግባር ገምጋሚ ቦርድ
 ባሕር ዳር ፣ ኢትዮጵያ

Bahir Dar University
 College of Medicine and Health Sciences
 Institutional Review Board
 Bahir Dar, Ethiopia



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 Facebook: College of Medicine and Health Sciences, Bahir Dar University, Ethiopia

IRB's Decision

Meeting No.: fullreview /2022 Date: March 11, 2022
 Protocol number: 363/2021 assigned No: 003

Protocol Title: - Assessment of insecticide treated bed nets utilization and associated factors among under five years children in Lasta district, North wollo zone , Amhara region, north east ethiopia,2021	
Principal investigator:	Asfaw Hailu zerihun
Co-investigators	
Institute:	College of Medicine and Health Sciences, Bahir Dar University
Elements Reviewed (CMHS/IRB 01 - 008)	<input checked="" type="checkbox"/> Attached <input type="checkbox"/> Not attached
Review of Revised Application <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Date of Previous review:
Decision of the meeting:	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Approved with Recommendation <input type="checkbox"/> Resubmission <input type="checkbox"/> Disapproved

- Elements approved:
1. Protocol Version No.: 01
 2. Protocol Version Date March 11, 2022
 3. Informed Consent Version: 01
 4. Informed Consent Version Date: March 11, 2022

- Obligations of the PI:
- ✓ Comply with Standard National and International Ethical Guidelines
 - ✓ All Amendments and Changes made in the Protocol and Consent Needs IRB Approval
 - ✓ Report SAE within 10 days of the event
 - ✓ End of the study, including manuscript and thesis works should be reported to IRB
- To NRERC

Institutional Review Board (IRB) Approval: Period from 03/11/2022 to 06/11/2022

Follow-up Report Expected in:
 3months 6months _____ 9months _____ One Year _____

Chairperson, IRB : Mulusew Andualem(PhD)

Signature
 Mulusew Andualem Asemahagn
 (PhD)
 Director of Research and
 Management Office



I. DECLARATION AND APPROVAL SHEET

Declaration

This is to certify that the thesis entitled "insecticide treated bed nets utilization and associated factors among under five children in Lasta districts, North Wollo zone, Amhara, Ethiopia" submitted in partial fulfillment of the requirements for the degree of Masters of Public Health in Field Epidemiology of Departments of Epidemiology and Biostatistics, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

Asfaw Hailu Asfaw August 17, 2022
Name of the student Signature Date

Approval sheet of thesis for defense

I hereby certify that I have supervised, read, and evaluated this thesis titled "insecticide treated bed nets utilization and associated factors among under five children in Lasta districts, North Wollo zone, Amhara, Ethiopia" by Asfaw Hailu prepared under my guidance. I recommend the thesis be submitted for oral defense

<u>Kekadnew Mulat</u>	<u>[Signature]</u>	<u>12-12-2014 E.C</u>
Advisor's name	Signature	Date
<u>Gebiyaw Woldu</u>	<u>[Signature]</u>	<u>12-12-2014 E.C</u>
Co-Advisor's name	Signature	Date
<u>Gebiyaw Woldu</u>	<u>[Signature]</u>	<u>12-12-2014 E.C</u>
Department Head	Signature	Date



Approval of thesis for defense result

As members of the board of examiners, we examined this thesis entitled “insecticide treated bed nets utilization and associated factors among under five children in Lasta districts, North Wollo zone, Amhara, Ethiopia” by Asfaw Hailu. We hereby certify that the thesis is accepted for fulfilling the requirements for the award of the degree of “Masters of Public Health in Field Epidemiology”.

Board of Examiners

External examiner name	Signature	Date
_____	_____	_____
_____	_____	_____

Internal examiner name	Signature	Date
<u>Abebaw Gedef</u>	<u>ng</u>	<u>12/12/14</u>
_____	_____	_____

Chair person's name	Signature	Date
_____	_____	_____