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ASSESSMENT OF KNOWLEDGE AND UTILIZATION OF INSECTICIDE TREATED NETS AMONG FREELY SUPPLIED HOUSEHOLDS IN WONAGO WOREDA, SNNPR

BY

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Table of contents

List of Tables

List of Figure

Abbreviations

FGD :- Focus Group Discussion

ITN :- Insecticide Treated Net

LL-ITN:- Long Lasting Insecticide Treated Net

SNNPR :- Southern Nations, Nationalities and Peoples Region

UNICEF :- United Nations International Children's Emergency Fund

WHO :- World Health Organization

HIV:- Human Immunodeficiency Virus

IPT:- Intermittent Preventive Treatment

Abstract

Background: Insecticide Treated Nets (ITNs) have become an important tool in the prevention of malaria. At present, large scale ITN programmes are being implemented in sub-Saharan Africa. Free distribution of ITNs is also underway in malaria endemic areas of Ethiopia. However, consistent follow up and documentation of their proper utilization and status is lacking.

Objectives: The aims of this study were to assess utilization of ITNs by households and children <5 years of age, knowledge of households about malaria & ITNs, the current condition of ITNs and the factors affecting its utilization, among freely supplied households.

Methods: A community-based cross-sectional study was conducted using interviewer-administered questionnaire and inspection to observe the condition of ITN(s). The study was conducted during June-July 2006 in Wonago Woreda, southern Ethiopia. Malarious Kebeles found in the study area were first stratified based on their distance: urban, nearest and farthest areas from urban. Then, 650 households freely supplied with at least one ITN were selected by systematic sampling technique using proportional allocation to size. Focus group discussions (FGDs) and in-depth interviews were also held to supplement the quantitative data.

Results: From 944 freely supplied ITNs for 638 households, 649(68.8%) ITNs were reported as currently used by households. The use of at least one of their freely supplied ITNs were reported in 482(75.5%) households, and children under five years of age slept under ITN in the previous night before the survey day were 452(58.0%). From a recently supplied ITNs inspected, 38.4% of them had at least one hole/tear (>2cm), and 97.0% of those with six months and above duration were not re-treated. Lack of insecticide was the main reason for not re-treating the nets. Households with separate bed room were found to be two times more likely to use their ITN than those who had no separate bed room [Adjusted OR=1.98, 95% CI: (1.24-3.16)]. Children found in households freely supplied with two or more ITNs were 1.59 times more likely to slept under ITN in the previous night than those supplied only one ITN [Adjusted OR=1.59, 95% CI: (1.03-2.46)]. Respondents who perceived ITN as a main preventive measure for malaria were found five times more likely their <5 children slept under ITN in the previous night than those found in households mentioned other main preventive measures [Adjusted OR=5.14, 95%CI: (3.29-8.03)].

Conclusions: This study revealed that all ITNs supplied to households were not used for the intended purpose. The reported utilization of freely supplied ITNs by households or under five year children were significantly affected by the unavailability of separate bed room, less number of ITNs supplied to households and less perception of respondents about ITNs as a main preventive measure. It is recommended that to strengthen health education activities about the benefit and proper use of ITNs, re-treating nets more than six months duration when obtained and increase the number of ITNs supplied to households.

1. Introduction

Malaria, that is a life threatening parasitic disease transmitted by mosquitoes, remains a major public health problem particularly in sub-Saharan Africa. Each year, 300-500 million malaria infections lead to over one million deaths (1), of which 90% occurring in sub Saharan Africa (2). Every 30 seconds a child in Africa dies of malaria (3). In Ethiopia, malaria is a public health concern for all groups of the population, although children <5 years of age and pregnant women are highly at risk (4). About 75% of the country's land is malarious and 67% of the population lives in areas at risk of malaria infection (5). About 65% of the population in Southern Nations and Nationalities People Region (SNNPR) is living in malaria endemic areas, and a total of 523,572 malaria cases reported in the region in 2005/06 (6).

Insecticide Treated Nets (ITNs) have become an important tool in the prevention of malaria. Various trials revealed that child mortality is reduced averagely by 20% for those using ITNs (7). At present, several African countries started scaling up free distribution or highly subsidized provision of ITNs for under five year children and pregnant women (8). The first initiative to adopt ITNs intervention strategy in Ethiopia was made in 1997/8. However, a survey done in 1999 indicated that only 5.3% of households reported the presence of at least one mosquito net (9). Another study conducted in Aleta Wondo, southern Ethiopia, also indicated the perception about prevention of malaria using ITNs were only 17.9% (10).

For ITNs to be fully effective, it should be used always even during seasons when their use is considered uncomfortable (in hot seasons) (11). The adoption of ITNs for malaria prevention may be hindered because of miss-conceptions about the cause and prevention of the disease (12). Fear of toxicity, frequent washing, lack of retreatment, inconsistent use, and other social and technical factors influence efficacy of nets. It is also common for nets to be totally left unused by any body especially when given freely (10,13).

According to the report of Wonago Woreda Health Office, ITNs freely distributed during 2003 to 2005 were 13,900 (64.6% coverage, assuming one ITN per household) (14). However, consistent follow-up whether they are properly used by households, status of ITNs such as presence of holes/tears, proper hanging and frequency of re-treatment were lacking. Therefore, the present study assessed the knowledge, utilization of ITNs and its current condition in Wonago woreda in SNNPR.

2. Literature review

ITNs reduce man-vector contact by physically excluding vector mosquitoes, killing them if they land on it or repelling them, thereby driving them from the vicinity of sleepers (15). The benefit of ITNs is not only to prevent malaria but it has an effect on other nuisance insects. For instance, it can eliminate bed bugs, head lice, and reduce the number of other flying and crawling insects (8). Other benefits of ITN include privacy, protection from dust and roof debris and warmth during the cold season (8). Core indicators to measure progress and outcome of ITNs include: the percentage of households possessing at least one ITN, the percentage of children < 5 who slept under ITN the previous night and the percentage of pregnant women who slept under ITN the previous night (16).

2.1 Burden of Malaria

Malaria is still a complex public health problem particularly in Africa, where 90% of the global malaria deaths occur. Although the disease affects the lives of nearly every one across Africa, children under the age of five years and pregnant women are the most vulnerable groups (17). It is not only the most serious health problem currently facing the countries in Africa but also a major

obstacle to their socio-economic development (2). Malaria has been estimated to cost African more than US$12 Billion every year, even thought it could be controlled for a fraction of that sum (1).

Another indirect cost of malaria is the human pain and suffering caused by the disease. Malaria also hampers children's schooling and social development through both absenteeism and permanent neurological and other damage associated with severe episodes of the disease (2, 18).

2.2 Global Malaria control Strategies

The World Health Organization (WHO) has prioritized four main strategies for malaria control (19)**.** These are provision of early diagnosis and prompt treatment, planning and implementation of selective and sustainable prevention measures including vector control, early detection co-containment and prevention of epidemics, and strengthening of local capacities in basic and applied research for regular assessment of the malaria situation within countries (19).

The Roll Back Malaria (RBM) initiative aims to reduce the global malaria burden by 50% by the year 2010 using three core interventions: access to prompt and effective treatment, universal use of ITNs with priority to young children and pregnant women, and intermittent preventive treatment (IPT) with at least two full doses of an effective, safe anti-malarial drugs in the second and third trimesters of pregnancy (16)**.** The use of ITNs has become a leading strategy in malaria prevention and control. One of the targets set by the Abuja Summit in April 2000 was 60% of the households to

have at least one ITNs by 2005 (20). Cost and low re-treatment rates for nets are the two main challenges in scaling up use of ITNs in countries (16,21).

2.3 Issues related to efficacy of ITNs

Regular use of ITNs has reduced child mortality by about 20% (7,22). To be most effective, mosquito nets must be retreated with recommended insecticides at least every 6 months to give maximum protection (22,23). The factors that were found to influence the effectiveness of ITNs were large family size, keeping livestock indoor during night time, using a mosquito net obtained a year or more, absence of re-treatment for more than 12 months, presence of hole or tears in the net, and frequent washing (10). An extended ITN programme in the Morogoro region of Tanzania found that 45% of all nets were in bad condition (defined as more than seven large holes) (24). In Malawi 12.8% of owners also reported that nets had holes larger than 2 cm in diameter (25).

The absence of re-treatment of ITNs might have greatly reduced ITN effectiveness. A study done in Aleta Wondo stated that 96.8% of ITNs were not retreated with an insecticide (10). The main reasons for not re-treatment were 71.3% service not available and 22.7% didn't know when to retreat (10). Frequent washing was also found to reduce effectiveness by about three times (26). After treatment, it is not recommended to wash them before six months. ITNs, unless it is long lasting, must be retreated again after it has been washed three times regardless of its duration or twice a year in areas that have mosquitoes all year round (27).

The effectiveness of an ITN program depends on: a good level of local knowledge about the use of ITNs, use by the most vulnerable members of the family (usually young children and pregnant women, but also all HIV-positive people), re-impregnation of the net (unless it is long lasting) with insecticide every six months and coverage greater than 80% (20,26,28).

2.5 Current use of ITNs

ITNs are designed in various shapes, colors and sizes to appeal to local tastes and meet local needs (1). By 2003, around 18 million ITNs had been sold or distributed in Africa: 8 million in East Africa. Around 13 million nets had been re-treated with insecticide, of which close to half were in East Africa (29). A base line surveys conducted in different localities of Ethiopia in 1999 indicated that only 5.3% of households reported the presence of at least one mosquito net (9).

Not all mosquito nets owned in African households are being used for young children. For instance, surveys done in 69 various regions of Africa revealed that in households owning ITN(s), reported use of ITNs during the preceding night by children under 5 years of age was on average 55% (30). A study done in western Kenya indicated that the ratio of number of families to possessed ITNs were 1.46 persons per ITN, and 30% of freely distributed ITNs were unused and the overall percentage adherence was 72.3% (65.9% for those < 5 years old and 74% for those greater or equal to 5years old) (31). The probability of adherence by individuals depended on age, temperature (people are less likely to use ITNs when it is hot), no room to hang the net and other factors (31). On the other hand, mosquito numbers, relative wealth, number of house occupants, and the

education level of the head of the household had no effect on adherence (31). Another study done in Kenya also revealed that 82.3% of mothers perceived no disadvantages of bed nets (32).

A baseline survey done in Ethiopia stated that respondents ever heard about mosquito nets were 41.0%, perceived the importance of using mosquito net to prevent morbidity and mortality 52%, and replied that mosquito net had no impact on malaria 19%(9). A study conducted in Aleta Wondo, SNNPR, also indicated that 62.5% of respondents understood mosquito bite is the cause of malaria, and 83.7% believe that ITN use is a main method of malaria prevention (10).

2.7 ITNs in Ethiopia

The use of ITNs is one of the major components of the selective vector control strategy targeted for areas with longer period of transmission, which in Ethiopia, is for a period of three months and above (33). The distribution of ITNs first introduced in resettlement areas of Western Tigray in 1997 provided by donors, such as WHO and UNICEF (34). The ITNs coverage to date in Ethiopia is about 24% of households with at least one ITN (33). The target for the next five years (2006 – 2010) is to achieve 100% coverage of all households in ITNs targeted areas with atleast one ITNs per households by 2007 (33). Distribution of ITNs will follow a segmented market approach with free distribution through the public sector to vulnerable social groups and new settlements in high risk area and through the subsidized and market operated distribution system in other areas (33).

The Federal Ministry of Health of Ethiopia takes a decision policy on tax rate alleviation of ITNs. The policy mainly focus on creation of awareness among communities to have a sense of ownership

of ITNs in malarious areas, particularly for <5 years children and pregnant women. The policy further requires re-impregnation of bed nets every six to twelve months. Insecticide for retreatment of nets for beneficiaries in the targeted villages should be provided free of charge (34). Options for types of insecticide are Permethrine and deltamethrine (K-OTab). The long strategy is to ensure that all exposed to malaria in Ethiopia should own and use a net that is either pretreated with a long lasting insecticide (it's useful life is estimated to be five years) or is regularly retreated (34).

Free distribution of ITNs is increasing in malaria endemic areas of the country to achieve 60% coverage of households by the year 2007(34). According to 2005/06 annual report, the SNNPR Health Bureau distributed 2.1 million ITNs (58.8% coverage) in the region, with the support of Global fund, UNICEF, Goal Ethiopia, Save the Children and other initiatives (6). The targets are all households in malarious areas of the region (6). However, continuous surveys are needed to assess the knowledge or perception of the households about the benefit of ITNs and its proper utilization particularly for under five year children. In addition, the status of ITNs, such as presence of holes, frequency of washing and re-treatment condition of ITNs requires follow up.

3. Objectives

3.1 General objective

To assess utilization of ITNs by households and children <5 years of age among freely supplied households, and identify the factors affecting its utilization, in Wonago Woreda.

3.2 Specific objectives

1. Investigate the reported use of freely supplied ITNs by households and children <5 years of age.

2. Assess the knowledge of the community about malaria and ITNs utilization.

3. Describe the current condition of ITNs in the households.

4. Identify the factors influencing the use of ITNs.

4. Research methodology

4.1. Study area and population

The study area was Wonago woreda located in Gedeo zone of SNNPR, 90km south of Awassa (the capital of SNNPR). According to the report from the Woreda Health Office, the total population for 2004 was estimated at 276,418 (25% urban and 75% rural) in 42 kebeles (9 urban and 33 rural) (14). Of which, 102,083 (30% urban and 70% rural) living in 12 malarious kebeles of the Woreda, their altitude is ranged between 1400-1500 meters above sea level. The estimated number of households in malarious kebeles was 21,419(6,433 urban and 14,986 rural). Malaria has been a number one health problem of the Woreda and reaches its peak from June to August and on December. There were 3,473 (1939 male and 1534 females) malaria cases reported in 2004/05 (14). There were 13,900 ITNs (10,060 in rural and 3,840 in urban) distributed (64.6% coverage, assuming one ITN per household) for malarious kebeles of the Woreda, with the support of Global fund, UNICEF, GOAL Ethiopia, Save the Children and others within two years (2003 - 2005) (14).

4.2 Study design

A community-based cross-sectional study was conducted using interviewer-administered questionnaire and inspection to observe the current condition of ITN(s) during day time. In addition, qualitative research methods using focus group discussions (FGDs) and in-depth interview were held to supplement the quantitative data.

4.3. Study population

For quantitative cross-sectional study, all households in malarious kebeles of the woreda owning at least one ITN were included in the study. Their list was obtained from the Woreda Health Office. Mothers or head of the households were interviewed. For FGDs, males/heads of households for the first group and mothers/care takers for the second group living in four study kebeles were considered. For in-depth interview, the responsible persons particularly malaria control team staff of the Woreda Health Office, Zonal Health Department and Regional Health Bureau were included.

4.4. Sample size

A sample size was determined using a single population proportion formula, where P is the proportion of households who were assumed to use their freely supplied ITNs (72%), taken from a trial study done in western Kenya (31). The sample size n was calculated by using the following formula, considered 5% for non-response rate and 2 as a design effect. Thus, the total sample size was **650.**

$$n = \frac{Z^2 \alpha/_2 \, P\,(1-P)}{d^2}$$

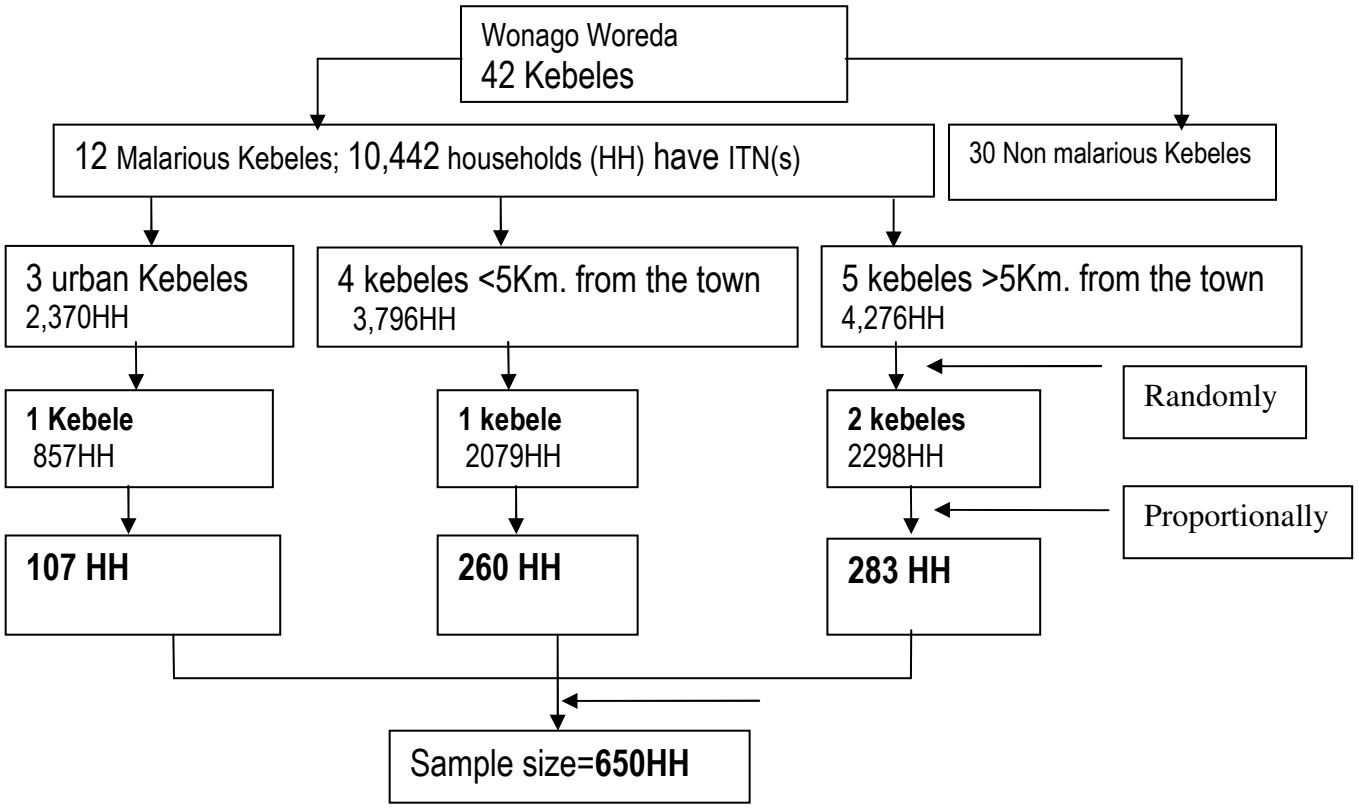
Where, $Z\alpha/_2 = 1.96$, $P = 0.72$, and $d = 0.05$

4.5. Sampling procedures

There are 12 malarious kebeles and 30 non-malarious kebeles in Wonago Woreda. Thirteen thousand nine hundred ITNs were distributed to 11,842 households in 12 malarious kebeles (14).

Then, all 12 malarious kebeles were stratified in to three categories based on their distance from the capital town of the district, Dilla. Thus, 3 kebeles in Dilla town, 4 Kebeles within five kilometers radius and the other 5 kebeles are located greater than five kilometers from the town. The assumption was that the socio-demographic factors such as educational level, occupational status and other factors that may affect utilization of ITNs may be different where the location of households becomes far away from the town. Four kebeles are selected randomly for the study (1 from the town, 1 from the kebeles around the town and 2 from kebeles far away from the town). Then, the study units, 650 households (107 from the first, 260 from the second and 283 from the third strata) were proportionally allocated according to their size of households having atleast one ITN. The study units were selected systematically from the list of households supplied with ITNs. The heads of households or mothers were interviewed and inspected by survey teams.

Fig.1. Schematic presentation of sampling procedure



Systematically

4.6. Data collection

Quantitative Data

A structured questionnaire was prepared first in English and then translated to Amharic. The latter version was back translated to English, to ensure its consistency. Then, the questionnaire was pre-tested in another kebeles with similar settings to the area under study in about 10% of the sample size and the questions that were difficult to respond are rephrased. A total of 12 enumerators (who completed grade 10 and who can speak Gedeoffa) and two sanitarians as supervisors were recruited, and a two days training was given for them. Regular daily supervision of the data collectors and checking of the completeness and accuracy of data was made by the principal investigator.

Qualitative Data

For the qualitative study, unstructured discussion guide was developed containing important points to explore the perception of the people towards utilization of ITNs (Annex-v), and the discussions were recorded by using Tape-recorder. Two FGDs were conducted. The first group was for males/heads of households, and the other group was for caretakers or mothers selected from four Kebeles included in the study. For each group 6-8 participants whose residential places are far apart were included. An in-depth interview was also conducted with the malaria team in the Woreda Heath Office, Zonal Health Desk and Regional Health Bureau. The discussion points were the

magnitude of malaria, control and prevention strategies, methods of ITNs distribution, and other relevant issues pertaining to utilization of ITNs.

4.7. Variables

Dependent: -

- Current utilization of ITNs by households and
- Under five years age children slept under ITN in the previous night the day before the survey.

Independent: -

- Socio-demographic variables: - such as age, educational status of respondent and of spouse, family size, type of house construction, availability of bed room, etc
- Knowledge about the cause and prevention of malaria, and benefits of ITNs
- Number of ITN freely supplied to households, date when obtained, shape and color of ITNs

4.8. Data processing and analysis

Data were checked for completeness and consistency and entered after coding in to EPI-info version 6 and analyzed using SPSS version 13. Frequencies and percentages were used to describe the socio demographic characteristics and other variables. Logistic regression analysis was done to compute crude odds ratio and adjusted odds ratio with 95% confidence intervals. P- Value was calculated for assessing the association between variables. The major factors influencing ITNs utilization among

ITNs possessed households were computed and interpreted at $p<0.05$ using 95% confidence interval for statistical significance. For the qualitative data the group discussions and in-depth interviews were transcribed completely in Amharic and then fully translated in English and summarized.

4.9. Ethical consideration

Ethical clearance for the study was obtained from the Department of Community Health at Faculty of Medicine, Addis Ababa University. Then a written letter from the Graduate coordinator of the Department was obtained and submitted to SNNPR Health Bureau. Similar letter written by the Regional Health Bureau was given to Gedeo Zone Health Department and then to Wonago Wereda Health Office. Informed verbal consent was obtained from each respondent before data collection was started.

4.10 Operational Definition

Current use/utilization of ITN by households: - all or some members of a household reported to sleep under ITN within the last one week (7 days) before the survey day.

Possession: - respondents reported that, they were freely supplied with at least one ITN before the survey day.

Recently given ITN:- an ITN having short duration when obtained, if households possessed one or more than one ITNs.

Illiterate: - respondents who can not read and write.

Literate:- respondents who have formal education or informal education (can read and write).

5. Results

5.1 Socio-demographic characteristics of the respondents

Of 650 households visited in the selected kebeles, data were collected on 638 households. Thus, the response rate was 98.1 %. Absence of respondents going far from area of resident at the time of data collection was the main reason for none response rate. From the total respondents 389(61%) were women and the rest 249(39%) were males. Of which 324(50.8%) were head of households and 314(49.2%) were their spouses. Seventy five (19.3%) of females were heads of households. The mean age of the respondents was 36.0 years and the average number of family members in the households was 5.9 people. Children under 5 years of age were found in 456 (71.5%) of households (Table1).

The larger proportion of respondents, 533(83.5%), were from rural area and most of them were Christians 629(98.6%). Majority, 542(85.0%) were married and 494 (77.4%) were Gedeo ethnic group. Regarding occupational status of respondents 256(40.1%) were housewives, 235(36.8%) farmers, and 147(23.1%) others (includes: daily laborer, merchant and mason). Two hundred eighty six (44.8 %) of the respondents were illiterate (did not able to read and write) and 352(55.2%) of respondents were literate (included: formal education and able to read and write) (Table 1). Regarding the type of housing construction, 373(58.5%) of houses were corrugated iron sheet roof and the remaining 265(41.5%) were thatched or plastic roof. From all households, 442(69.3%) had separate bed room, whereas 196(30.7%) had no separate bed room. In addition, 170(26.6%) households reported that livestock shared their living room during night (Table 1).

Table1. Socio-demographic characteristics of respondents, Wonago woreda, SNNPR, 2006.

Characteristics(n=638)	**Male**(n=249) **No.(%)**	**Female**(n=389) **No.(%)**	**Total No.(%)**

Age of respondent(Mean=36.0 years)			
15 - 29	78(12.2)	178(27.9)	256(40.1)
30 – 44	88(13.8)	150(23.5)	238(37.3)
≥ 45	83(13.0)	61(9.6)	144(22.6)
Address of respondent			
Dilla town	30(4.7)	75(11.8)	105(16.5)
Distance within 5km. from town	104(16.3)	152(23.8)	256(40.1)
Distance >5km. from town	115(18.0)	162(25.4)	277(43.4)
Religion of respondents			
Protestant	167(26.2)	306(48.0)	473(74.1)
Orthodox	59(9.2)	48(7.5)	107(16.8)
Catholic	17(2.7)	32(5.0)	49(7.7)
Other	6(0.9)	3(0.5)	9(1.4)
Marital status of respondents			
Married	229(35.9)	313(49.1)	542(85.0)
Single	10(1.6)	11(1.7)	21(3.3)
Widowed	8(1.3)	60(9.4)	68(10.3)
Divorced	2(0.3)	5(0.8)	7(1.1)
Occupation of the respondents			
Government employee	16(2.5)	7(1.1)	23(3.6)
Merchant	33(5.2)	54(8.5)	87(13.7)
Farmer	180(28.2)	55(8.6)	237(36.9)
Housewife	0(0.0)	256(40.1)	256(40.1)
Other	18(2.8)	19(3.0)	37(5.8)
Educational status of respondent			
Didn't read and write	54(8.5)	232(36.4)	286(44.8)
Read and write	3(0.5)	5(0.8)	8(1.3)
Grade 1-4	62(9.7)	65(10.2)	127(19.9)
Grade 5-10	106(16.5)	80(12.5)	186(29.2)
Above grade 10	24(3.8)	7(1.1)	31(4.9)
Type of house construction			
Corrugated Iron sheet	145(22.7)	228(35.7)	373(58.5)
Thatched / plastic cover	104(16.3)	161(25.2)	265(41.5)
Availability of separate bed room			
Yes	177(27.7)	265(41.5)	442(69.3)
No	72(11.3)	124(19.4)	196(30.7)
Livestock share living room at night			
Yes	75(11.8)	95(14.9)	170(26.6)
No	174(27.3)	294(46.1)	468(73.4)
Family size(Mean= 5.9)			
≤5	102(16.0)	195(30.9)	297(46.6)
>5	147(23.0)	194(30.4)	341(53.4)

5.2 Knowledge of respondents about malaria and ITNs

From the total respondents, 270(42.3%) mentioned mosquitoes as the main causes of malaria, whereas the rest of respondents perceived living near stagnant water 137(21.5%), get cold 46(7.2%), presence of wastes 40(6.3%), drinking dirty water 30(4.7%), being hungry 14(2.2%), being in the rain 11(1.7%), other such as flower of maize 27(3.9%) and did not know were responded by 51(8.0%). Regarding the main preventive measures of malaria, ITNs use was stated by the majority of respondents 399(62.5%). The other responded, take tablets 89(13.9%), proper disposal of wastes 68(10.7%), use traditional plants 22(3.4%), fumigants 22(3.4%), use insecticide sprays 20(3.1%), drainage 11(1.7%) and other methods 7(1.1%). (Table 2)

Concerning education messages about ITNs, 497(77.9%) of the respondents were ever heard/seen any message about it. The sources of information were health workers 250 (50.3%), community meetings 193 (38.8%), a radio 60 (12.0%), television 19 (3.8%), family members 18 (3.6%), and other sources such as friends 19 (3.8%). The majority 622 (97.5%) of respondents perceived that sleeping under ITN has a benefit. The reported benefits were, to prevent mosquito bite 569 (91.4%), to prevent other insect nuisance 195 (31.4%), to prevent malaria 103 (16.4%), to get warmth 23(3.8%) and other reasons such as to protect dusts from the roof 2(0.3%). On the other hand, only 33 (5.2%) of respondents reported problems associated with sleeping under ITN; difficult to get up at night was the main problem described by 13(39.4%) of the respondents (Table 2).

Table 2. Knowledge of respondents about the cause and prevention of malaria, and the benefits and problems of sleeping under ITNs, Wonago woreda, SNNPR, 2006

Variable (n=638)	Male No.(%)	Female No.(%)	Total No.(%)
Main cause of malaria			
Bitten by mosquitoes	97(15.2)	173(27.1)	270(42.3)
Living near collected water	73(11.4)	64(10.0)	137(21.5)
Get cold	15(2.4)	31(4.9)	46(7.2)
Presence of wastes	11(1.7)	29(4.5)	40(6.3)
Drinking dirty water	11(1.7)	19(3.0)	30(4.7)
Being hungry	2(0.3)	12(1.9)	14(2.2)
Being in the rain	3(0.5)	8(1.3)	11(1.7)
Other	6(1.0)	19(3.0)	27(3.9)
I did not know	23(3.6)	28(4.4)	51(8.0)
Main preventive measure of malaria			
Use ITN	166(26.0)	233(36.5)	399(62.5)
Take tablets	29(4.5)	60(9.4)	89(13.9)
Proper disposal of wastes	29(4.5)	39(6.1)	68(10.7)
Use traditional plants	6(0.9)	16(2.5)	22(3.4)
Fumigants	4(0.6)	18(2.8)	22(3.4)
Use insecticide sprays	6(0.9)	14(2.2)	20(3.1)
Drainage	7(1.1)	4(0.6)	11(1.7)
Other	2(0.3)	5(0.8)	7(1.1)
Ever heard/seen education messages about ITNs			
Yes	217(34.0)	280(43.9)	497(77.9)
No	32(5.0)	109(17.1)	141(22.1)
Think that sleeping under ITN have benefit			
Yes	246(38.6)	376(58.9)	622(97.5)
No	3(0.5)	13(2. 0)	16(2.5)
The benefits of sleeping under ITN(n=622)			
Don't get bitten by mosquito	226(36.3)	343(55.1)	569(91.4)
Don't get bothered by other insects	74(11.9)	121(19.5)	195(31.4)
Don't get malaria	44(7.1)	59(9.3)	103(16.4)
To get warmth	9(1.5)	14(2.3)	23(3.8)
Other	0(0)	2(0.3)	2(0.3)
Believe that sleeping under ITN has problem			
Yes	13(2.0)	20(3.2)	33(5.2)
No	236(37.0)	369(57.8)	605(94.8)
Problems associated to sleeping under ITN(n=33)			
Difficult to getup at night	6(18.2)	7(21.2)	13(39.4)
It is too hot to sleep under ITN	2(6.0)	4(12.1)	6(18.1)
It takes time to tuck a net each night	1(3.0)	4(12.1)	5(15.1)
Mosquito can still bite through ITN	2(6.0)	2(6.0)	4(12.0)
No enough air when sleeping under	1(3.0)	2(6.0)	3(9.0)
Other problems	1(3.0)	1(3.0)	2(6.0)

5.3 ITN possession and utilization

All households (n= 638) were freely provided with at least one ITN. Total number of ITN supplied to such households were 944, of which 649(68.8%) ITNs were currently used by households. Three hundred fifty seven (56.0%) of households were supplied with one ITN and 281(44.0%) with two or more ITNs. The mean possession was 1.48 ITN per household, and a ratio of number of family members to number of possessed ITNs were 3.98 persons per one ITN. The majority 511(80.1%) of a recently supplied ITNs were six months and above duration when obtained, but only 127(19.9%) of them were less than six months duration (Table 3). Mean duration of recently given ITN(s) for households was 8.4 months (range 3-24months).

Even though all households under study were supplied at least one ITN, unavailability was reported in 84(13.2%) of household at the time of the survey. The reasons were, 39(46.4%) of households reported their ITN was lost or stolen, 21(25.0%) used for other purposes (i.e wear as clothing, screen for windows, etc), 15(17.9%) expired, 7(8.3%) given to other relatives, and 2(2.4%) of them sold their ITN. In addition, 72(11.3%) of households not used their available nets due to: non conduciveness of housing construction 33(45.8%), absence of bed 14(19.4%), perceived nets can not prevent malaria 7(9.7%), afraid of ITNs toxicity 4(5.6%), and due to other reasons such as absence of mosquitoes, and difficulty to tuck a net, 14(19.5%). Thus, 156(24.5%) of households not use and 482(75.5%) of them use at least one of their freely supplied ITNs. Majority 436(90.5%) reported use their ITN always; 46(9.5%) often use their net. Seven hundred seventy nine under 5 years of age children were found in 456(71.5%) of households. From all under five children, 452(58.0%) slept under ITN in the previous night before the survey day, and from 63 pregnant women 47(74.6%) of them slept under ITN in the previous night (Table 3).

Table 3. ITNs possession and utilization by households and under five year age children, Wonago woreda, SNNPR, 2006.

Characteristics	Frequency	Percent
Number of ITN(s) freely supplied for households (n=638)		
One/household	357	56.0
Two/household	256	40.1
Three/household	25	3.9
Reported situation of ITNs (n=944)		
Currently used	649	68.8
Not used	295	31.2
Date when a recent ITN supplied (n=638)		
< 6 months	127	19.9
≥ 6 months	511	80.1
Availability of at least one of freely supplied ITNs(n=638)		
Yes	554	86.8
No	84	13.2
Reasons for unavailability of ITNs(n=84)		
Lost/stolen	39	46.4
Used for other purposes	21	25.0
Expired; then thrown away	15	17.9
Given to others	7	8.3
Sold	2	2.4
Households reported use at least one of their available ITNs(n=554)		
Yes	482	88.7
No	72	11.3
Reasons for not using the available ITNs(n=72)		
Housing structure affects net use	33	45.8
Absence of bed	14	19.4
Nets do not prevent malaria	7	9.7
Afraid of its toxicity	4	5.6
Other	14	19.5
Households current use of at least one of freely supplied ITN(s) (n=638)		
Yes	482	75.5
No	156	24.5
Frequency of using their ITN (n=482)		
Always	436	90.5
Often	46	9.5
Children <5 years age slept under ITN in the previous night(n=779)		
Yes	452	58.0
No	327	42.0
Pregnant women slept under ITN in the previous night(n=63)		
Yes	47	74.6
No	16	25.4

5.4 The current condition of ITNs

Among households whose ITN(s) was available (n=554) at the time of the survey, one of a recently supplied ITN was inspected to see their current condition during day time. Regarding the presence of hole/tear, 213(38.4%) of ITNs have at least one hole (>2cm diameter). Of which 86(40.1%) of them had more than seven holes/tears. Two hundred forty two (43.6%) were washed at least once, of which 173(71.5%) washed three or more times. From nets its duration six and above months when obtained 447, most 427(95.5%) were ITNs and the rest 20(4.5%) were long lasting ITNs. Most ITNs 414(97.0%) was not retreated. Lack of insecticide for re-treatment of nets was the main reason for not re-treatment, encompassed 354 (85.5%). Concerning the shape of ITNs, the majority 534(96.4%) were rectangular in shape, and 20(3.6%) conical in shape. Two hundred thirty one (41.7%) of ITNs were green in color, 228(41.2%) of blue and 95(17.1%) of white in color (Table 4).

Table 4. Current condition of recently given ITNs for those households their ITN is found during data collection (n=554), Wonago woreda, SNNPR, 2006.

Characterstics	Frequency	Percent
ITNs ever been washed		
Yes	242	43.7
No	312	56.3
Frequency of washing (n=242)		
One to two times	69	27.1
Three or more times	173	71.5
Presence of hole/tear on ITN		
Yes	213	38.4
No	341	61.6
Number of holes (n=213)		
1-7	127	59.6
>7	86	40.4
Type of nets having ≥ 6 months (n=447)		
ITNs	427	95.5
LL-ITNs	20	4.5
ITN retreated in the preceding 6 months(n=427)		
Yes	13	3.0
No	414	97.0
Reported reasons for not re-treatment(n=414)		
Lack of insecticide	354	85.5
Lack of skill	16	3.9
Don't know its importance	17	4.1
Other	27	6.5
Households at least one of their ITN hanged over the bed/mat		
Yes	398	71.8
No	156	28.2
Shape of a recently given ITN		
Rectangular	534	96.4
Conical	20	3.6
Color of a recently given ITN		
White	95	17.1
Green	231	41.7
Blue	228	41.2

5.5 Logistic regression analysis for utilization of ITNs by households

Bivariate and multivariate analysis was done for selected socio demographic factors, condition of ITNs and knowledge or perception of respondents with reported use of at least one of their ITNs by households. Households living in urban area were found to be 2.26 times more likely to use their ITNs compared to those who lived in the farthest rural households from the town in crude odds ratio [OR=2.26, 95%CI=1.24-4.10] but not significant after adjusting for other socio demographic variables. Regarding educational status, literate respondents were 1.73 [Crude OR=1.73, 95%CI=1.20-2.46] times more likely to use their ITN than illiterates, but not significant after adjusting. Households with five or less than family members were found to be 0.67 times less likely to use their ITN than those with greater than five family size [Crude OR=0.67, 95%CI=0.47-0.97] but not significant after adjusting for other socio demographic factors. Similarly, the type of housing construction, households with corrugated iron sheet roof were 2.31 times more likely to use at least one of their ITNs compared to those who have thatched or plastic cover roof [Crude OR=2.31, 95%CI=1.60-3.35] but not after adjusting for other socio demographic factors. Availability of separated bed room in respondents home were 2.56 times more likely to use at least one of their freely supplied ITNs [Crude OR=2.56, 95%CI=1.76-3.73] and almost two times more likely to use their ITN after adjusting for other socio-demographic factors [Adjusted OR=1.98, 95%CI=1.24-3.16]. Age of respondents and livestock share the living rooms at night were not found to be associated with household's current use of at least one of freely supplied ITNs (Table5).

Table 5. Comparison of ITN use by households and socio-demographic factors of respondents, Wonago woreda, SNNPR, 2006.

Characteristics(n=638)	Households currently use at least one of their ITN		Crude OR 95%CI	Adjusted OR 95%CI
	Yes	No		
Age of respondent				
15-29	194	62	1.24(0.78,1.97)	0.85(0.54,1.33)
30-44	185	53	1.38(0.86,2.23)	1.11(0.66,1.88)
≥45	103	41	1.00	1.00
Address(distance)				
Dilla town	89	16	1.74(0.95,3.16)	1.85(0.97,3.51)
≤5km. from town	182	74	0.76(0.52,1.13)	1.35(0.71,2.58)
>5km. from town	211	66	1.00	1.00
Education of respondent				
Illiterate	200	86	1.00	1.00
Literate	282	70	1.73(1.20,2.49)**	1.31(0.88,1.97)
Education of spouse				
Illiterate	150	48	1.017(0.68,1.50)	1.28(0.83,1.97)
Literate	332	108	1.00	1.00
Family Size				
≤ 5	213	84	0.67(0.47,0.97)*	0.81(0.55,1.20)
>5	269	72	1.00	1.00
Type of house construction				
Corrugated Iron Sheet roof	306	67	2.31(1.60,3.35)**	1.45(0.89,2.36)
Thatched/plastic	176	89	1.00	1.00
Availability of separated bed room				
Yes	359	83	2.56(1.76,3.73)**	1.98(1.24,3.16)**
No	123	73	1.00	1.00
Livestock shared living room at night				
Yes	128	42	0.98(0.65,1.47)	1.19(0.77,1.85)
No	354	114	1.00	1.00

**P-value < 0.01 *P-value < 0.05

Households supplied with two or more ITNs were 3.15 times more likely to use at least one of their ITNs when compared to those who were supplied only one ITN [Crude OR=3.15, 95%CI=2.10-4.74] and also significant association after adjusting for availability of separate bed room and other conditions of ITNs [Adjusted OR=2.03, 95%CI=1.19-3.45]. On the other hand, duration of a recently given ITN, its color and shape were not found statistically associated with utilization of at least one of freely supplied ITNs by households (Table 6).

Respondents perceived that sleeping under ITN is the main preventive measure for malaria were found to be 8.09 times more likely to use their ITN than those who mention other main preventive measures [Crude OR=8.09, 95%CI=5.37-12.21] and 6.74 times more likely to use their ITN after adjusting for socio demographic and condition of ITNs [Adjusted OR=6.74, 95%CI=4.38-10.39]. Similarly, respondents ever heard education messages about ITNs were 1.85 times more likely to use their ITN compared to those who did not heard any education message about ITNs [Crude OR=1.85, 95%CI=1.23-2.79] but not after adjusting. On the other hand, respondents perception of mosquitoes as the main cause of malaria and their thinking of sleeping under ITN has a problem were not found significantly associated to use of ITNs by households (Table 6).

Table 6. Comparison of current use of freely supplied ITNs with the condition of nets and knowledge of respondents about malaria & ITNs; Wonago woreda, SNNPR,2006.

Characteristics	Households currently use at least one of their ITN		Crude OR 95%CI	Adjusted OR 95%CI
	Yes	No		
ITNs freely supplied to households				
One	239	118	1.00	1.00
Two or more	243	38	3.15(2.10,4.74)**	2.03(1.19,3.45)**
Date when a recent ITN obtained				
< 6 months	91	36	0.77(0.50,1.20)	0.82(0.44,1.52)
≥ 6 months	391	120	1.00	1.00
Shape of ITN(n=554)				
Rectangular	468	63	1.18(0.34,4.16)	1.17(0.30,4.60)
Conical	14	6	1.00	1.00
Color of ITN(n=554)				
White	81	14	0.83(0.44,1.57)	0.92(0.46,1.82)
Green and Blue	401	58	1.00	1.00
Main cause of malaria				
Bitten by Mosquito	214	56	1.42(0.98,2.07)	1.08(0.70,1.67)
Other	268	100	1.00	1.00
Main prevention of malaria				
Sleeping under ITN	358	41	8.09(5.37,12.21)**	6.74(4.38,10.39)**
Other	124	115	1.00	1.00
Ever heard/seen education message about ITN				
Yes	389	108	1.85(1.23,2.79)**	1.38(0.85,2.25)
No	93	48	1.00	1.00

Using ITN have problem				
Yes	28	5	1.86(0.70,4.90)	2.32(0.93,4.52)
No	454	151	1.00	1.00

**P-value <0.01

5.6 Logistic regression results for utilization of ITNs by under-five years age children

Children < 5 years age found in respondents age group 15-29 years were 0.70 times less likely to slept under ITN in the previous night than those with the higher age group of respondents [Crude OR=0.70, 95%CI: (0.51-0.95)] but statistical association was not found after adjusting for other socio demographic factors. Regarding the type of housing construction, under 5 years age children found in households with corrugated iron sheet roofs were 1.45 times more likely to slept under ITN in the previous night compared to those who found in thatched or plastic cover roofs [Crude OR=1.45, 95%CI: (1.08-1.94)] but not after adjusting for other socio demographic factors. Children <5 years age found in households with separated bed room were also 1.59 times [Crude OR=1.59, 95%CI: (1.17-2.27)] more likely to slept under ITNs than those did not have separate bed room, but not after adjusting for other socio demographic factors (Table 7).

Table 7. Comparison of children < 5 years age slept under ITN in the previous night before the interview day and selected socio-demographic characteristics of respondents, Wonago woreda, SNNPR, 2006.

Characteristic	Number of Children <5 years age slept under ITN in the previous night		Crude OR 95%CI	Adjusted OR 95%CI
	Yes(n=452)	**No**(n=327)		
Age of respondent				
15-29	197	159	1.43(0.92,2.21)	0.59(0.30,1.13)
30-44	205	116	1.79(0.99,3.25)	1.13(0.59,2.15)
≥ 45	50	52	1.00	1.00
Address(distance)				
Dilla town	77	44	1.73(0.94,3.20)	1.36(1.10,3.65)
≤ 5 km. from town	160	131	0.95(0.62,1.46)	1.44(0.91,2.25)
>5km. from the town	215	152	1.00	1.00
Education of respondent				
Illiterate	175	138	0.86(0.64,1.15)	1.34(0.88,2.05)
Literate	287	189	1.00	1.00
Education of spouse				
Illiterate	135	93	1.07(0.78,1.46)	1.25(0.78,1.98)
Literate	317	234	1.00	1.00
Family size				
≤5	147	121	0.82(0.60,1.10)	2.41(0.85,6.83)
>5	305	206	1.00	1.00

Type of housing construction				
Corrugated Iron Sheet	288	179	1.45(1.08,1.94)*	1.14(0.67,1.910)
Thatched/plastic roof	164	148	1.00	1.00
Availability of separate bed room				
Yes	335	210	1.59(1.17,2.17)**	1.28(0.75,2.18)
No	117	117	1.00	1.00
Livestock shared living room at night	122	91	0.95(0.69,1.31)	0.76(0.47,1.24)
Yes	330	236	1.00	1.00
No				

**P-value < 0.01 *P-value < 0.05

Children's found in households with two or more freely supplied ITNs were about two times more likely to slept under ITNs than those found in households supplied with only one ITN [Crude OR=1.91, 95%CI: (1.43-2.55)] and 1.59 times more likely to use their ITN after adjusting for other conditions of ITNs [Adjusted OR=1.59, 95%CI: (1.03-2.46)]. However, duration of a recently given ITN, its color and shape were not found statistically associated with children's slept under ITN in the previous night before the survey day (Table 8).

Respondents perception of ITN as a main preventive measure for malaria were found almost 3 times more likely their under 5 children slept under ITN in the previous night than those mentioned other main preventive measures [Crude OR=2.99, 95%CI: (2.43-4.04)] and also significantly associated after adjusting for other knowledge responses and number of freely supplied ITNs [Adjusted

OR=5.14, 95%CI: (3.29-8.03)]. Respondents ever heard education messages about ITNs were found to be 1.68 times more likely their under five children slept under ITN in the previous night than those who did not heard any education message [Crude OR=1.68, 95%CI: (1.18-2.39)] but not after adjusting for other knowledge responses. Similarly, under five years age children found in respondents perceived that sleeping under ITN has a benefit were 3 times more likely to slept under ITN in the previous night than those found in respondents perceived in the other way round [Crude OR=3.07, 95%CI: (1.15-8.18)] but not after adjusting. On the other hand, respondents perception of mosquitoes as the main cause of malaria and sleeping under ITN has a problem were not found significantly associated to their under-five children slept under ITN in the previous night before the survey day (Table 8).

Table 8. Comparison of children under 5 years age slept under ITN in the previous night, versus condition of ITNs, and knowledge of respondents about malaria and ITNs, Wonago woreda, SNNPR, 2006.

Characteristics	Number of children < 5 years age slept under ITNs in the previous night		Crude OR 95%CI	Adjusted OR 95%CI
	Yes	No		
Number of ITNs supplied to households				
One	194	193	1.00	1.00
Two or more	258	134	1.91(1.43,2.55)**	1.59(1.03,2.46)*
Date when a recent ITN obtained				
< 6 month	82	70	0.81(0.57,1.62)	0.91(0.51,1.61)
≥ 6 month	370	257	1.00	1.00
Shape of ITN				

Rectangular	439	217	1.71(0.75,3.88)	0.74(0.21,2.57)
Conical	13	11	1.00	1.00
Color of ITN				
White	77	48	0.77(0.51,1.15)	0.58(0.30,1.09)
Green or Blue	375	180	1.00	1.00
Main cause of malaria				
Mosquito bite	197	127	1.21(0.91,1.62)	1.17(0.74,1.84)
Other	255	200	1.00	1.00
Main prevention method				
Use ITN	333	158	2.99(2.21,4.04)**	5.14(3.29,8.03)**
Other	119	169	1.00	1.00
Ever heard message about ITN				
Yes	378	246	1.68(1.18,2.39)*	1.52(0.89,2.57)
No	74	81	1.00	1.00
Think that sleeping under ITN has benefit				
Yes	446	314	3.07(1.15,8.18)*	3.32(0.75,14.67)
No	6	13	1.00	1.00
Think that sleeping under ITN has problem				
Yes	23	9	1.89(0.86,4.15)	2.31(0.70,7.64)
No	429	318	1.00	1.00

** P- value < 0.01 *P- value < 0.05

5.7 Results of Focus Group Discussion

Focus group discussion was done with two groups to explore the perception of the community members in the study area. Each group encompassed 6-8 members, 8 males in the first group and 6 females in the other group selected by the community leaders. The average age of males was 42.2(range 34-65) and that of females as 38.1(range 28-55). They were represented from four kebeles: Dilla, Chichu, Tokicha and Hase Haro. Regarding their educational status, 42.8% of the discussion participants were found illiterate (not able to read and write), 35.8% of them were able to read and write, and the other 21.4% were grade 1-5.

Major issues concerning the cause and prevention of malaria practiced by the community and seasons when malaria problem reaches its peak were discussed. The main causes of malaria mentioned by the majority of male discussants include; poor environmental sanitation, living near stagnant water and bitten by mosquitoes. “Get cold and work when raining” were also indicated by some female participants in addition to the former mentioned causes. Regarding prevention and control measures the major activities were treatment when they are sick, sanitation of their vicinity, drainage of stagnant waters, sleeping under mosquito net, separating domestic animals from living room, and keeping personal hygiene. Of which using ITN is the best method to prevent malaria as concluded by both group of participants. Most of the participants of the two groups agreed that malaria as a major health problem in the area. They also explained, “Most people were affected by malaria from the first weak of June to the end of August and during December”.

Regarding the method of distribution of ITNs, most male and female participants stated that “the distribution system was fair”, that means it was based on the family size: households with large family sizes were supplied with more than one ITN and households with small family size have got only one ITN. On the contrary, one female participant was complaining the system of distribution. She said, “*The households with small family size are supplied with only one ITN was not enough. When the ITN becomes dirty or torn or stolen, they couldn’t have another option for substitution. Therefore, they will be exposed to mosquito bite.*”

Problems associated with the use of ITN are mentioned by most of the participants of both groups. They said, “Almost all ITNs obtained before six months were not retreated with a chemical to kill mosquitoes; as a result they may not be able to kill mosquitoes”. One of the female participants said

that "*at the time of net distribution the health workers told as the nets should be retreated every six months, but it was not still practiced"*. In addition, the majority of male participants group replied that, "they prefer green or blue color ITNs rather than the white one. Because, the white color ITNs attract dust particles and became dirty within a short period of time". The other issues raised by all participants were, house construction with no bed room particularly thatched roof houses are difficult to tuck a net.

Most of the female and majority of male groups also agreed that using ITNs for other purposes other than the intended purpose were the main problem, such as, "clothing of their children, protection of female hair (believed to kill hair louse) and for screening of their windows". In addition, ITNs also sold for others. One male participant explained, "*People living in highland areas came and bought the ITNs from the lowlands"*. The reason mentioned by him was, "distribution of net excludes the former mentioned areas even though there is malaria problem there". Poverty is also the other reason for sale of freely supplied ITNs.

Most female and some male participants indicated that, "priority was given for parents to use their ITN. If there is only one under five children in the family, he/she slept under ITN with their parents. Otherwise, when more than one child is available, some of them may sleep with their elderly or other relatives, so that they did not have a chance of sleeping under ITN".

The participants in both group also suggested some solutions to minimize or to avoid the above mentioned problems. These are: there should be some mechanism to control the sale of freely given

ITNs, health education about the benefit of ITNs should be strengthened, nets should be retreated timely and if possible mosquito nets should be given for households who didn't obtain it before.

5.8 Results of In-depth Interview

Concerned bodies related to malaria prevention and control activities at different level in the region were interviewed. Two malaria control experts (one from Wonago woreda Health Office and one from SNNPR Health Bureau) and one communicable disease control team leader from Gedeo Zone

Health Department were participated in the interview. They had a minimum of two years experience in the positions they were working. Discussion points were, the extent of malaria problem, activities to prevent and control malaria, distribution mechanism of ITNs, re-treatment practice of nets for those more than six months duration when distributed, problems identified related to net utilization and other related issues concerning utilization of ITNs.

It is totally accepted by all respondents that, morbidity and mortality due to malaria was considered as the number one health problem in the region. Distribution of ITNs freely for those households living in malaria endemic areas was the major prevention and control strategy in the region besides insecticide spray, environmental control activities and other methods. The main sources for ITNs in the region were donors, such as UNICEF, WHO, and Global Fund.

Regarding the distribution mechanism, ITNs collected in the Regional or Zonal level are sending to the Woreda health office, then to kebeles. The kebele administration body select and register households based on their family size and the presence of <5 children. Then, after giving health education by health workers or community health agents, ITNs were freely supplied based on family size - households with more than five family members could get more than one ITN. The regional malaria expert stated that, “this system was applied because of shortage of ITNs otherwise not more than three persons use a single ITN”.

The regional expert and Zonal disease control team leader as well as the Woreda expert explained that, re-treatment of ITNs were not still performed for those nets six months and above duration and frequently washed ITNs. The reason was, said the respondents, “The absence of chemical used to retreat ITNs, such as KO-tab”. The other reason they mentioned was the beginning of distributing

long lasting ITNs (nets that do not require re-treatment) may also reduce the attention for re-treating the previously supplied ITNs.

Problems related to the housing condition of most rural and some urban residences indicated by the participants. All respondents mentioned that, “the smoke produced from burning of wood in households and unavailability of separate bed room were creating some problem on the use of nets, such as an ITN become dirty and change its color to black instead of the original white, blue or green color. Thus, the households frequently washed their net with soap and water by assuming that it is dirty”. As a result, its efficacy to kill mosquitoes may decrease unless it is retreated. In addition, the durability of a net would also affected – become torn or expired before the desired period.

6. Discussion

The study indicated that the ratio of number of family members to number of ITN(s) freely supplied was 4 persons per a single ITN. It was found not enough when compared to a study done in western

Kenya, 1.46 persons per ITN, indicating sufficient amount of ITNs for use by the community (31). A regional malaria control expert also stated that, not more than one to three persons can use a single ITN of such size distributed in the area. This implies there is a need to increase the number of ITNs supplied to households. The result also revealed that 31.2% of ITNs were found not used. It is consistent to a study done in western Kenya; about 30% of ITNs were unused (31). This study also revealed that 58% of under five years of age children were slept under ITNs in the previous night, that was almost similar to a survey done in 69 regions (12 malaria endemic countries in Africa), 55% reported use of nets by under 5 children among net possessed households (30). But, it was less when compared to a study done in western Kenya, 65.9% of under-five children slept under ITN in the previous night (31). The reason may be priority was given for adults, so that a child slept with his/her elderly might not get a chance to use an ITN. It was also supported by focus group discussion.

The study indicated that 42.3% of respondents perceived mosquito bite as a main cause of malaria and 62.5% of them thought that net use is a main preventive measure for malaria. It was found less by about 20% when compared to a survey done in another place of the same region, 62.5% and 83.7% of respondents replied similarly (10). The possible reason for this may be the majority of respondents included in this study were from rural areas, less access for health information and relatively low educational status. This study also stated that 77.9% of respondents were ever heard education messages about mosquito nets, is highest when compared to a survey done at country level, only 41.0% replied the same thing (9). The difference may be, the presence of extended promotion of ITNs was underway when this study was conducted. The other possible explanation is

only households that are freely supplied with ITN(s) are included in this study – increased probability of getting messages about nets.

ITNs should be retreated twice a year in areas that have mosquitoes all year long; otherwise its effectiveness to kill mosquitoes and to prevent malaria decreases (27). From observed ITNs duration six and above months, most of them were not retreated with a product to kill mosquitoes. The main reason for not re-treatment was lack of insecticide. It is consistent with a study done in Aleta Wondo, 96.8% of ITNs were not retreated, and unavailability of the service was the major reason (10). Among ITNs found during survey, about one-third of recently given nets were washed at least three times, but not retreated with a chemical to kill insects. It is recommended that, ITNs (if not long lasting ITNs) must be retreated again after it has been washed three times (27). This is because frequent washing can reduce effectiveness of ITNs by about three times (17). Literatures indicated that presence of holes/tears on nets was found significantly increase probability of malaria infection (10). According to the findings of this study two-fifth of the inspected ITNs had at least one hole (≥ 2cm diameter). The possible reason for this may be the absence of separated bed room to hang their net and frequent washing. In addition, 40.4% of them were more than seven holes. This was almost similar with a study done in Tanzania, 45% of ITNs were in bad condition (more than 7 large holes) (24). But it was high when compared to a survey done in Malawi, 12.8% of owners reported that nets had holes larger than 2cm in diameter (25). The reason may be due to housing condition of respondents, absence of separate bed room, and long duration of ITNs.

Few ITNs were not available during the survey. ITNs lost/stolen from their home were the main reason reported by most respondents for its unavailability. But, participants in group discussion

stated that many freely supplied ITNs are sold by a number of individuals. They may afraid to tell the truth, because they would think that a government could stop any support in the future, if they knew we used it for other purposes. Few households also stored the available ITNs as packed or not used at all. Housing construction was the main reason for not used the available ITNs by the household members. This is also supported by quantitative analysis; those living in corrugated iron sheet roof were found to be more likely used their ITN than those living in thatched/plastic cover houses.

Households with large family size were found more likely to use their ITN than those with small family size. The reason may be the distribution of ITNs mainly based on family size, those having large family size were supplied with more than one nets. This implies if one of households ITN was damaged, torn, stolen, sold, or not ready to use by any means, they have an opportunity to use the other(s). This is also supported by focus group discussion.

The result revealed that availability of separate bed room was significantly associated with the use of ITNs by households, before and after adjusting with other socio demographic factors. Other study done in Kenya was also revealed that use of nets depended on housing construction and absence of separated room to hang it (31). It indicates that there is a need to educate and support households to improve and manage their living room in order to make suitable for hanging and using their net.

In addition, households supplied with two or more ITNs were found significantly associated with reported use of at least one of their ITNs by households and under five children slept under ITN in

the previous night, even after adjusted with other factors. This may indicate the provision of enough ITNs proportional to family size was advantageous for its utilization. On the contrary, households supplied with a single ITN may be confused to decide who sleep under it; as a result they left it unused or sold or used it for other purposes.

Respondent's perceived that sleeping under ITNs is the main preventive measure to prevent malaria was also significantly associated with reported use of ITNs by households and under five children slept under ITNs in the previous night. This indicates that distribution of ITNs without convincing the households to accept its importance will not bring the desired result. Thus, a sustainable health education activity about advantages of ITNs is important for its proper deployment. On the other hand, educational status of the spouse of respondents, livestock shared living room, duration when net is obtained and respondents perceived that mosquito bite as a main cause of malaria are not found to be associated with use of at least one of their ITNs by households and under five children slept under ITN in the previous night.

7. Strengths and Limitations of the study

Strength of the study

- In order to check or confirm the presence and the current condition of freely supplied ITNs, visual inspection was done during the time of data collection.
- Respondents were represented from all residential settings; urban, nearest to urban and farthest rural communities of the study area.

Limitation of the study

- It is obvious that people use ITNs during night time. So that, it will be better to observe the actual net use during night time. Where as, reported use of ITNs was taken in this study because of various reasons.
  - Recall bias: respondents could not remember the exact date when they obtained ITN(s) because of long duration.
  - Not many studies conducted particularly in Ethiopia, made difficult in comparing results.

8. Conclusions and recommendations

Even though, the survey indicates two third of ITNs owned by households reported to be used, most nets obtained before six months are not retreated again once obtained. In addition to this considerable number of recently obtained ITNs are frequently washed (three or more times) and have hole or tear. Therefore, their efficacy to prevent malaria is under question.

This study also revealed that not all ITNs supplied to households are used for the intended purpose. The reported utilization of freely supplied ITNs by households or under five years children were highly affected by unavailability of bed room, less number of ITNs supplied to households and less perception of ITNs as a main preventive measure to control malaria. In addition, type of housing construction, never heard education messages about mosquito nets, poor perception of individuals about the benefit of nets were also found to be contributing factors for the use of ITNs by households, and under five years age children slept under ITNs in the previous night.

The recommendations include:-

- Possession of ITNs in households was found not proportional to their family size. Therefore, the number of ITNs supplied to households should be increased and also consider their color preference.

- Support or help households how to improve their living room in order to make it conducive for utilization of their ITNs.
- Strengthen health education activities about the benefit and proper use of ITNs to the community at large and at household level in particular.
- Those ITNs having six months or more duration when possessed for households should be re-treated with a chemical to kill mosquitoes in order to keep its efficacy.
- Distribution of long lasting ITNs should be strengthened; it decreases the need for re-treatment of nets.
- Further study using direct observation at sleeping time rather than reported use is important to assess proper deployment of ITNs.

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Annex-I Questionnaire *(English version)*

AAU Department of Community Health

Assessment of knowledge and utilization of ITNs among freely supplied households in Wonago woreda, SNNPR, 2006.

- Questionnaire number	____ _____ ____ ____
- Name of Kebele	_____
- Personnel	A/ Interviewer B/Field supervisor _____
- Date of visit	_____

Introduction and Consent

My name is _____ and I' am one of the data collectors from Addis Ababa university. We are conducting a survey about the Knowledge and utilization of mosquito nets in collaboration with Wonago Woreda Health Office. We would very much appreciate your participation in this survey. The information will help the Regional Health Bureau to control malaria. The survey usually takes between 20 to 25 minutes to complete. Whatever information you provide will be kept strictly confidential and will not be shown to other person.

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 fully in this survey since your views are important.

Do you have any questions about the survey?

May I begin the interview now?

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_____

General Information

Q001	What is your age?(in years)	_____
Q002	Sex of the respondent	1.Male 2.Female
Q003	The place of living room	1. Urban 2. Rural
Q004	What is your responsibility in the household?	1.Head 2.Wife/ Husband 3.Daughter/son 4.Others, specify_____
Q005	What is your Religion?	1. Orthodox 2. Protestant 3. Catholic 4. Muslim 4. Other, specify_____
Q006	What is your Marital Status?	1.Single 2.Married 3.Divorced 4.Widowed
Q007	What is your Ethnicity?	1.Gedeo 2.Amhara 3.Oromo 4.Tigre 5.Sidama 6.Gurage 7.Other, specify_____
Q008	Educational status of the respondent	1.Can't read & write 2.Read and write 3.Grade 1-4 4.Grade 5-10 5.Grade 11-12 6.10+1 up to 10+3 7.Tertiary level
Q009	Occupation of respondent	1.Government Employee

		2.Merchant 3.Farmer 4.House wife 5.Daily laborer 6.Other, specify_____
Q010	Educational status of the Spouse	1.Can't read & write 2.Read and write 3.Grade 1-4 4.Grade 5-10 5.Grade 11-12 6.10+1 up to 10+3 7.Tertiary level
Q011	Occupation of the spouse	1. Government Employee 2. Merchant 3.Farmer 4.house wife 5.Daily laborer 6.Other, specify _____
Q012	Total household members	_____
Q013	Total number of < 5 year children in the household	_____
Q014	Total pregnant women in the household	_____
Q015	The type of house construction	1. Thatched roof 2. Corrugated Iron sheet 3. Other, specify _____
Q016	Do you have bed room for the family?	1. yes 2. No
Q017	If the answer for Q016 is yes, how many bed rooms are there?	1.None 2.One 3.Two 4.Three or more
Q018	If the family has bed, how many beds are there?	_____
Q019	Do livestock's share your living room during	1.yes

	night time	2.No
2. Knowledge about the cause and prevention of malaria		
Q.020	What is the main cause of malaria you know of? (one answer only)	1. Working in the sun 2. Being in the rain 3. Being hungry 4. Getting cold 5. Drinking dirty water 6. Living near collected water 7. Another person with malaria 8. Being bitten by Mosquitoes 9. Don't know 10 .Other, specify ____
Q021	Are there any other ways you can get the disease? (if any) (Multiple answer possible)	1. Working in the sun 2. Being in the rain 3. Being hungry 4. Getting cold 5. Drinking dirty water 6. Living near collected water 7. Another person with malaria 8. Being bitten by Mosquitoes 9. Don't know 10 .Other, specify _____
Q022	What is the most important thing you do in your household to prevent getting malaria (if any)? (one answer only)	1.Nothing 2.Use a mosquito net 3.Use chemicals (insecticide sprays, DDT, Malathion, etc.) 4. Take tablets 5. Close door & windows at

		night 6. Use traditional plants 7. use fumigants 8. Drainage of stagnant water 9. proper disposal of wastes 10. Other, specify _____
Q023	What other things, if any, do you do to prevent malaria? (multiple responses possible)	1. Nothing 2. Use a mosquito net 3. Use chemicals (insecticide sprays, DDT, Malathion, etc.) 4. Take tablets 5.Close door & windows at night 6. Use traditional plants 7. use fumigants 8. Drainage of stagnant water 9. proper disposal of wastes 10. Other, specify _____
Q024	Have you seen or heard any educational messages about mosquito nets?	1. Yes. 2. No
Q025	If yes, where did you see or hear these education messages from? (multiple response possible)	1. On Radio 2. On Television 3.In Newspaper / magazines 4. In pamphlets/ poster 5. Community event 6. Health workers 7. Friends 8. Parents 9. Schools 10. Other (specify) _____
Q026	Do you think mosquito nets have any benefit?	1. Yes 2. No
Q027	If yes, what do you think are the benefits of sleeping under a mosquito net? (multiple response possible)	1.Don't get bitten by mosquito 2. Don't get malaria 3. Don't get bothered by other insects

		4. To get warmth 5. Other, specify _____
Q028	Do you think there are problems associated with sleeping under a net?	1. Yes 2. No 3. Don't know
Q029	If yes, what are they?	1. It is too hot to sleep under a net 2. Mosquito can still bite through the net 3.It is difficult if you want to get up in the night 4. It takes time to tuck the net each night 5. there is not enough air 6. Other, specify
1. About the use of Mosquito nets		
Q030	How many ITNs do you have that was given free or bought?	1.one 2.Two 3.Three 4.More than three
Q031	Is/ are the ITN(s) available in the household? (observe)	1. Yes…….escape to Q033 2. No
Q032	If no, what is the reason?	1. Lost/Stollen 2. Used for other purposes 3. Soled 4. Other, specify
Q033	If the answer for Q029 is yes, how many mosquito nets do you have in your household? (observe)	1.One 2. Two 3. Three 4. More than three
Q034	For how long have you had mosquito nets in this	

	house?(the recent net if more than one)	_____
Q035	How did you obtain your Mosquito net(s)?	1. Given free 2. I bought it from 3. I can't remember 4. Other, specify _____
Q036	Has the net(s) been used while sleeping? (for the last two weeks)	1. Yes 2. No ……if no, escape to Q047
Q037	How frequently you are using the net?	1.Always 2.Often 3.Other, specify_____
Q038	If yes, how many of your mosquito nets are used? (fore those more than one ITNs)	1.One 2.Two 3.Three 4.More than three
Q039	If the answer for Q034 is yes, who is currently sleeping under a mosquito net? (multiple answer possible)	1. Father 2. Mother 3. Children 4. Elderly 5. Father and Mother 6. Mother and children <5 7.Father, mother and child <5 8. Pregnant women 9. Other, specify ____
Q040	Did the child (ren) sleep under the net in the last one week?	1.Yes 2.No 3.I don't Know 4.No <5 children in the HH
Q041	Did the child (ren) sleep under the net the previous night?	1. Yes 2. No 3. I don't know (not sure) 4. No <5 Children in the HH
Q042	If the answer is Yes for Q041, how many children under age 5 slept in the household last night under the mosquito net?	1. one 2. Two 3. Three or more

Q043	Did the pregnant women slept under the net in the previous one week?	1.Yes 2.No 3.I don't know 4.No pregnant women in the HH
Q044	Did the pregnant women slept under the net in the previous night?	1.Yes 2.No 3.I don't know 4.No pregnant women in the HH
Q045	If the answer is yes for Q044, how many pregnant women slept in the last night under the net (if any)?	1.one 2. Two 3.Three or more
Q046	Do you think that you/ your family are protected from malaria after using ITNs?	1.Yes 2.No
Q047	If the answer for Q036/41/44 is No, what are the reasons?	1. Nets do not prevent against malaria 2. there is no mosquito 3. It is too hot sleeping in a net 4. house construction affects net use 5. It was not a malaria transmission season 6. Nets size do not suitable for use. 7. Fear of toxicity 8. It is lost or misplaced 9.Child rollout of net 10.Nets is too hard to put up and take down 11. other, specify_____
4.About the current status of mosquito nets (If the answer for Q029 is Yes)		
Q048	Have any of your ITNs ever been washed?	1. Yes 2. No
Q049	If yes how often did you wash your ITNs? (recently owned ITN if more than one net was washed)	1. Every _____ day 2. Every _____ week 3. Every _____ month 4. Every _____ year

Q050	Was the mosquito net ever treated with a product to kill mosquitoes	1. Yes 2. No.....escape to Q052
Q051	If yes, was it treated in the last six months?	1. Yes .....escape to Q053 2. No
Q052	If no, what is the reason?	1.because it is long lasting 2. Lack of insecticide 3. Lack of skill 4.Don't know its importance 5. other, specify_____
Q053	Was the mosquito net having a hole /tear? (Observe the net)	1. Yes 2. No.....escape to Q055
Q054	If yes, how many tears are there? (observe the net, count only >2cm holes)	_____
Q055	Was the mosquito net(s) hanged over the bed/mat?(observe)	1. Yes 2. No
Q056	If the answer for Q053 is No, where is it placed? (Observe)	1.Under the bed/mattress 2. Placed on the wall area 3. Put in a bag or other storage 4. Other, specify_____
Q057	What is the shape of the ITNs? (observe) (The recent one if more than one ITNs)	1. Rectangular 2. Conical
Q058	What is the Color of ITNs? (observe) (the recent one if more than one)	1.White 2.Blue 3.Green 4.Other_____

Annex-II Questionnaire *(Amharic version)*

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• 004	••• ••• ••• ••••• ••••••✎	1. ••••• ••• 2. ••• 3. •• 4. •• ••• ••••_____
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• 006	•••• ••• •••• ••✎	1.••••(•) 2.•••(•) 3.•••(•) 4.••(•••) •••••(•••)
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• 009	•••••• ••• •••✎	1. •••••• •••• 2. ••• 3. ••• 4. ••• •••• 5. ••• •••• 6. •• ••• ••••_____
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Annex-III

Guide Questions for Focus Group Discussion

1. What is/are the main causes of malaria?

2. What are the major activities you do to prevent malaria in your locality?

3. What do you think is the best method to prevent malaria?

4. What are the problems have you observed related to ITNs utilization? (Including housing condition, color, shape, etc.)

5. How fair is the distribution of ITNs?

6. Is re-treatment of ITNs done timely? If not, what are the reasons?

7. Do you think that malaria problem decreases in your area after using ITNs?

8. What do you suggest to solve the problems associated to use of ITNs?